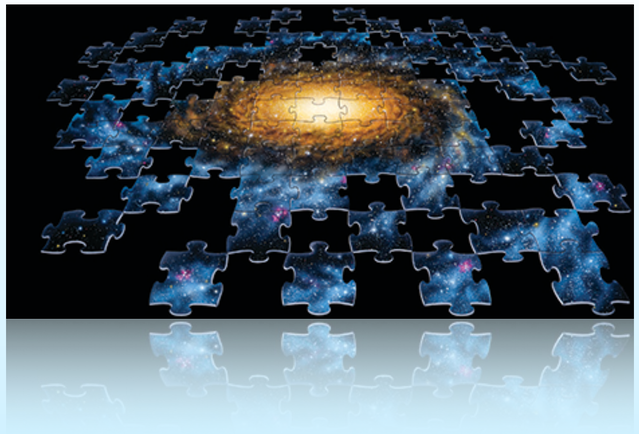
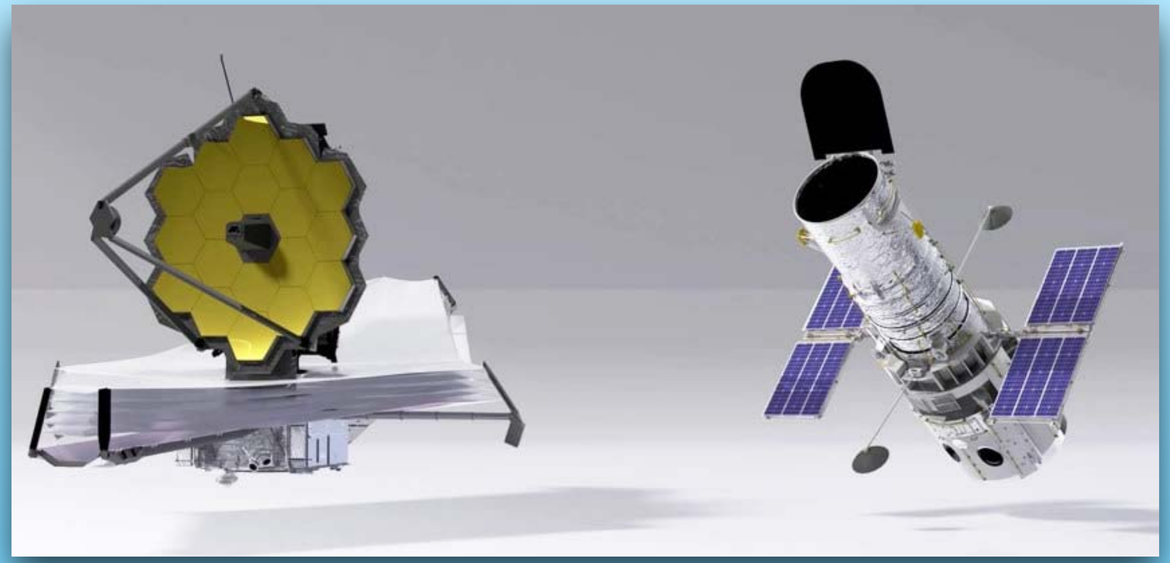
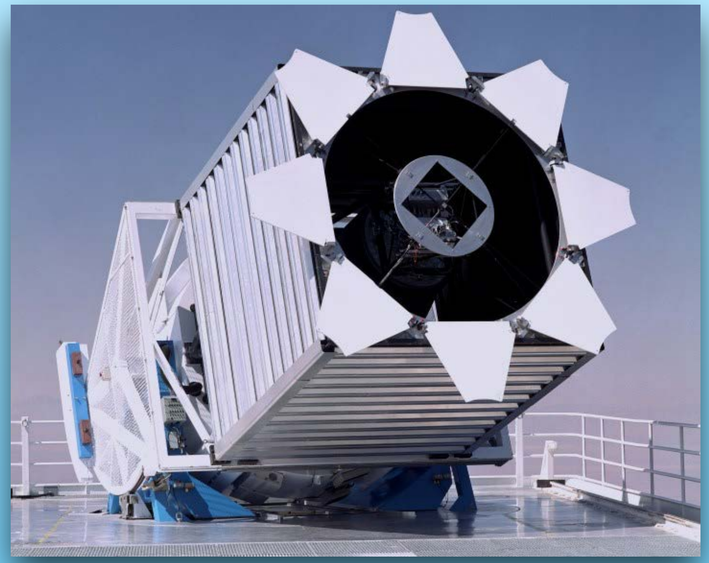


For convenient initial review, criticism, and sharing,
this is a ~30% preview of the complete slide deck.

The original slide numbers appear at top right.





Minkowski's foundations of spacetime physics and SDSS data motivate reassessment of ΛCDM cosmology

The results of this investigation are conclusive.

Anomalous high-z JWST observations (c. 2022) are definitively explained, having been accurately predicted and modeled herein.

Alexander F. Mayer

SensibleUniverse.net

IN MEMORIAM – THOMAS LEIGH PHINNEY

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This slide updated 31 Aug. 2022.

You are encouraged to review this fact-finding and independently reproduce all analyses and results. *Due to the unusually disruptive nature of this work, scientific integrity must overrule personal agendas.*

Online self-study slides* including copious text are obviously not intended for audience presentation; this PDF is a digital research report and textbook.

* Internet links are attached to references, names, and graphics in the PDF; cursor typically switches to a hand pointer 👆 when hovering over the links. A minority of all available links are highlighted with the link indicator. *N*🔗

MNRAS 000, 1–12 (2022) Preprint 26 July 2022 Compiled using MNRAS LATEX style file v3.0

The evolution of the galaxy UV luminosity function at redshifts z ≃ 8 – 15 from deep JWST and ground-based near-infrared imaging

C. T. Donnan[1]★, D. J. McLeod[1], J. S. Dunlop[1], R. J. McLure[1], A. C. Carnall[1], R. Begley[1], F. Cullen[1]
M. L. Hamadouche[1], R. A. A. Bowler[2], H. J. McCracken[3], B. Milvang-Jensen[4,5], A. Moneti[3] & T. Targett[6]
[1]*Institute for Astronomy, University of Edinburgh, Royal Observatory, Edinburgh, EH9 3HJ. UK*
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[3] *Institut d'Astrophysique de Paris, UMR 7095, CNRS, and Sorbonne Université, 98 bis boulevard Arago, 75014 Paris, France*
[4] *Cosmic Dawn Center (DAWN)*
[5] *Niels Bohr Institute, University of Copenhagen, Jagtvej 128, 2200 Copenhagen, Denmark*
[6] *Department of Physics and Astronomy, Sonoma State University, 1801 East Cotati Avenue, Rohnert Park, CA 94928-3609, US*

ABSTRACT

…

Our sample contains 6 galaxies at $z \geq 12$, one of which appears to set a new redshift record as an apparently robust galaxy candidate at $z \simeq 16.7$, the properties of which we therefore consider in detail. The advances presented here emphasize the importance of achieving high dynamic range in studies of early galaxy evolution, and re-affirm the enormous potential of forthcoming larger JWST programmes to transform our understanding of the young Universe.

This slide added 31 Aug. 2022.

Draft version July 29, 2022
Typeset using LaTeX **twocolumn** style in AASTeX62

Panic! At the Disks: First Rest-frame Optical Observations of Galaxy Structure at $z > 3$ with JWST in the SMACS 0723 Field

Leonardo Ferreira,[1] Nathan Adams,[2] Christopher J. Conselice,[2] Elizaveta Sazonova,[3] Duncan Austin,[2] Joseph Caruana,[4,5] Fabricio Ferrari,[6] Aprajita Verma,[7] James Trussler,[2] Tom Broadhurst,[8,9,10] Jose Diego,[11] Brenda L. Frye,[12] Massimo Pascale,[13] Stephen M. Wilkins,[14,15] Rogier A. Windhorst,[16] and Adi Zitrin[17]

ABSTRACT

We present early results regarding the morphological and structural properties of galaxies seen with the James Webb Space Telescope at $z > 3$ in the Early Release Observations of SMACS 0723, a galaxy cluster at $z = 0.39$. We investigate, for the first time, the optical morphologies of a significant number of $z > 3$ galaxies with accurate photometric redshifts in this field to determine the form of galaxy structure in the relatively early universe. … We discover the surprising result that at $z > 1.5$ disk galaxies dominate the overall fraction of morphologies, with a factor of ~ 10 relative higher number of disk galaxies than seen by the Hubble Space Telescope at these redshifts.

This slide added 31 Aug. 2022.

Abstract

Do not ‘skim’ this summary — read these statements slowly and carefully.

The objective, statistical nature of SDSS astrophysical datasets, which were not driven by any theoretical agenda, reveal false and misleading prior measurements (e.g., redshift-distance) driven by confirmation bias in the context of such agendas. SDSS data, including theta-z, redshift-magnitude (both photometric and spectroscopic pipelines), and galaxy population-density, are shown to conflict with the ΛCDM standard cosmological model. Moreover, all four of those distinct and independent data sets are similarly consistent with a new cosmological model that revives de Sitter’s 1917 exact solution to the field equations, long thought to entail an “empty universe.” Representing a paradigm shift in cosmology, that new model is entirely distinct from the textbook “de Sitter universe” model. It derives from considerations of symmetry and local proper time modeled as a geometric object, motivated by Minkowski’s metric characterization of relativity. All of the new predictive equations, which incorporate no free parameters, are confronted with corresponding SDSS data sets, thereby resolving the modern quandary of astrophysical observables interpreted as accelerating cosmic expansion induced by ‘dark energy.’ The canonical idea of a non-relativistic universal time coordinate applicable to all of cosmological space and its energy content (i.e., ~13.7 Gyr of ‘Cosmic Time’ from initial singularity) is supplanted by a relativistic, strictly-local time coordinate involving no such inscrutable space-time singularity.

The talk on “Space and Time,” which Hermann Minkowski gave at the Convention of German Scientists and Doctors in Cologne, is the last of his ingenious creations. Unfortunately, it was not destined for him *to finish the more detailed development of his audacious concept* of a mechanics in which time is integrated with the three dimensions of space.

– A. Gutzmer

Since my student years Minkowski was my best, most dependable friend who supported me with all the depth and loyalty that was so characteristic of him. …*what death cannot take away is his noble image in our hearts and the knowledge that his spirit in us continues to be active*.

– David Hilbert

Sloan Digital Sky Survey

SDSS.org

Sloan Foundation
2.5-m Telescope
Apache Point, NM

This presentation is
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Image credit: Reidar Hahn, *Fermilab Visual Media Services*

SDSS glossary reference

petroRad

The Petrosian radius. A measure of the angular size of an image, most meaningful for galaxies. Units are seconds of arc. The Petrosian radius (and related measures of size called `petroR50` and `petroR90`) are derived from the surface brightness profile of the galaxy, as described in Algorithms.

Surface Brightness

The frames pipeline also reports the radii containing 50% and 90% of the Petrosian flux for each band, `petroR50` and `petroR90` respectively.

Source: https://www.sdss.org/dr14/help/glossary/#P

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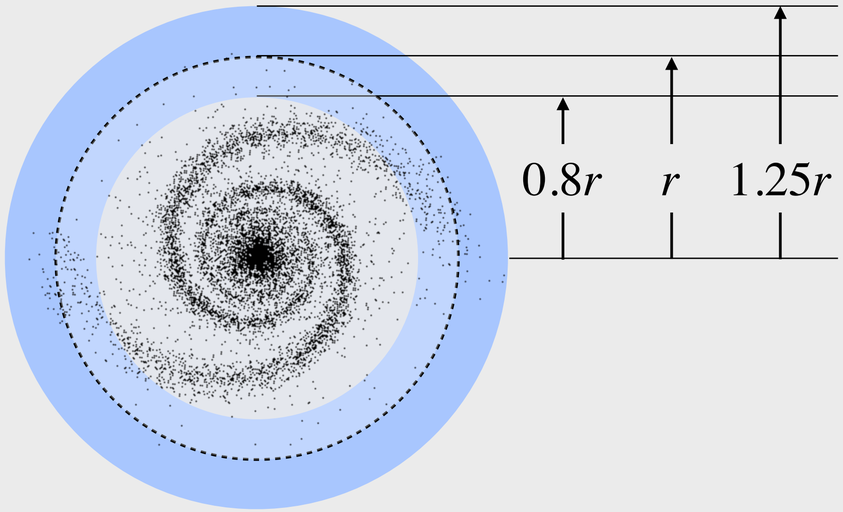
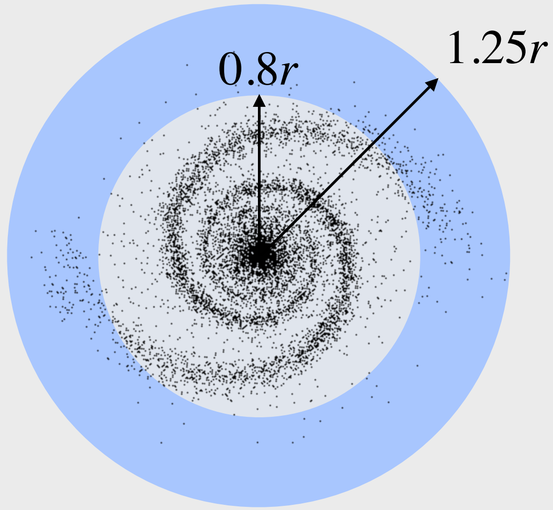
Petrosian radius (SDSS “petroRad” measurement)



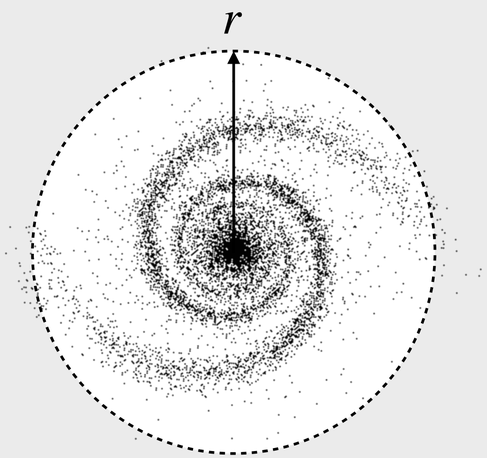
Here, r is a variable measurement;
it is not a recorded measurement.

DEFINITION: “Petrosian ratio,” $\mathscr{R}_{\rm P}(r) =$



local surface brightness
in annulus (blue region)

÷



mean surface brightness
measured inside radius r

Define $\mathscr{R}_{\rm P,lim}$ as $\mathscr{R}_{\rm P}(r_{\rm P}) = \mathscr{R}_{\rm P,lim}$ where $r_{\rm P}$ is the measured and recorded Petrosian radius. $\mathscr{R}_{\rm P,lim} = 0.2$ for the SDSS:

Varying r, when $\mathscr{R}_{\rm P}(r) = 0.2$, then $r_{\rm P} = r$.

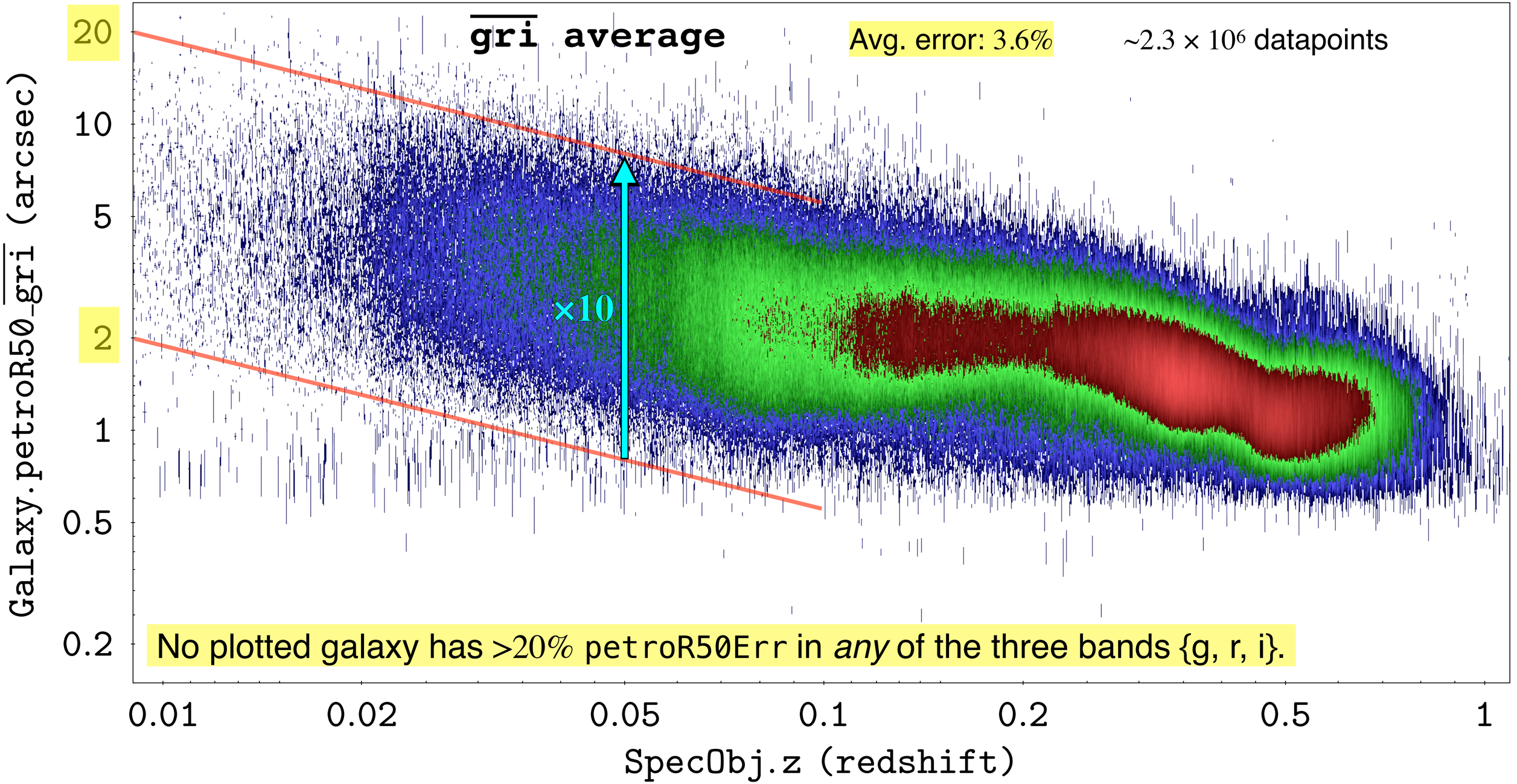
$$\mathscr{R}_{\rm P}(r) \equiv \frac{\int_{0.8r}^{1.25r} {\rm d}r' 2\pi r' I\left(r'\right) / \pi\left(1.25^2 - 0.8^2\right) r^2}{\int_0^r {\rm d}r' 2\pi r' I\left(r'\right) / \pi r^2}$$

The observed radial galaxy brightness profile [$I(r')$] is “azimuthally averaged” (i.e., averaged over 2π radians).

Reference: https://www.sdss.org/dr14/algorithms/magnitudes/#mag_petro

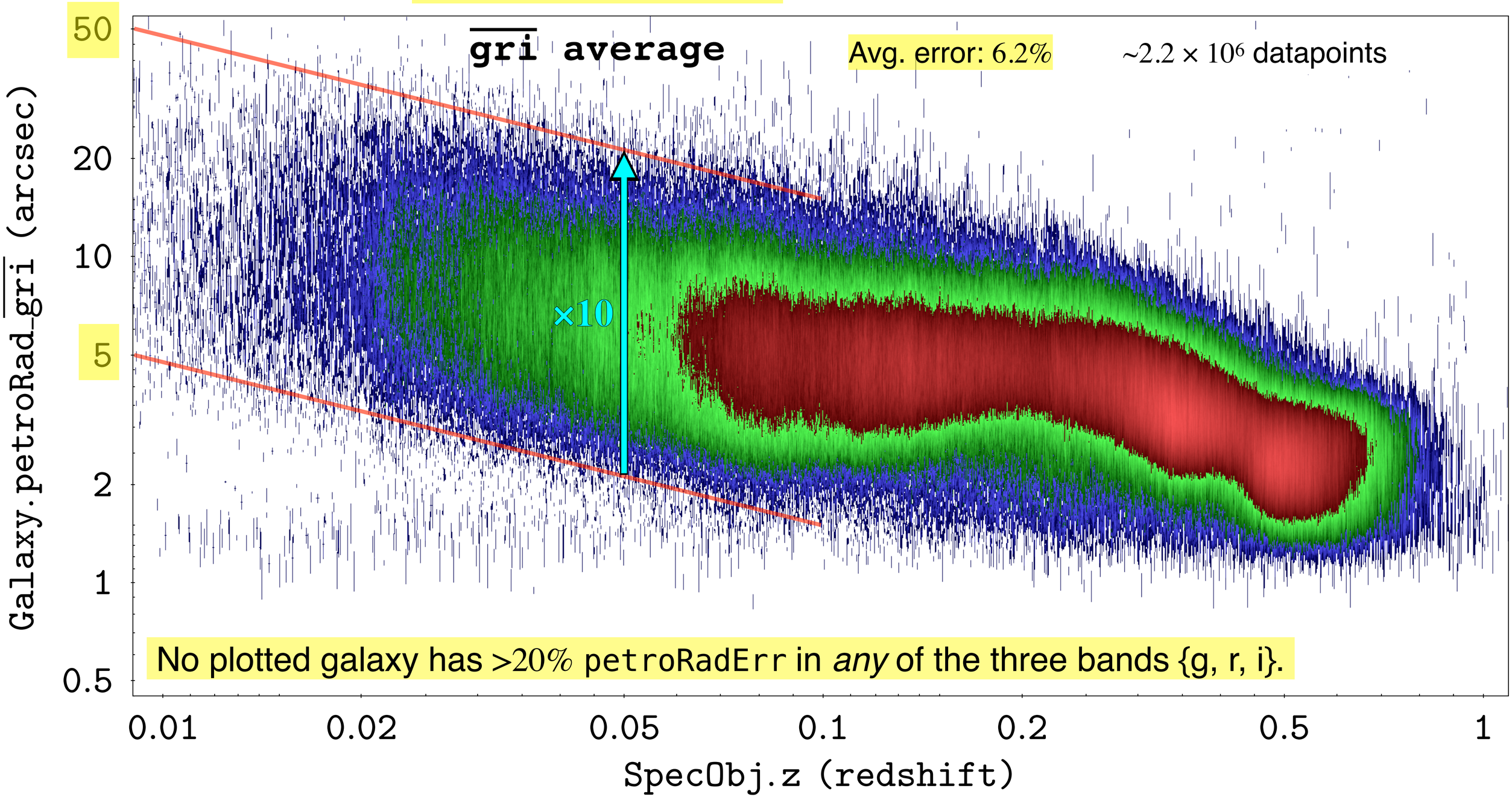
Theta-z (half-light radius)

$\sim 755 \times 10^3$ galaxies plotted



Theta-z (Petrosian radius)

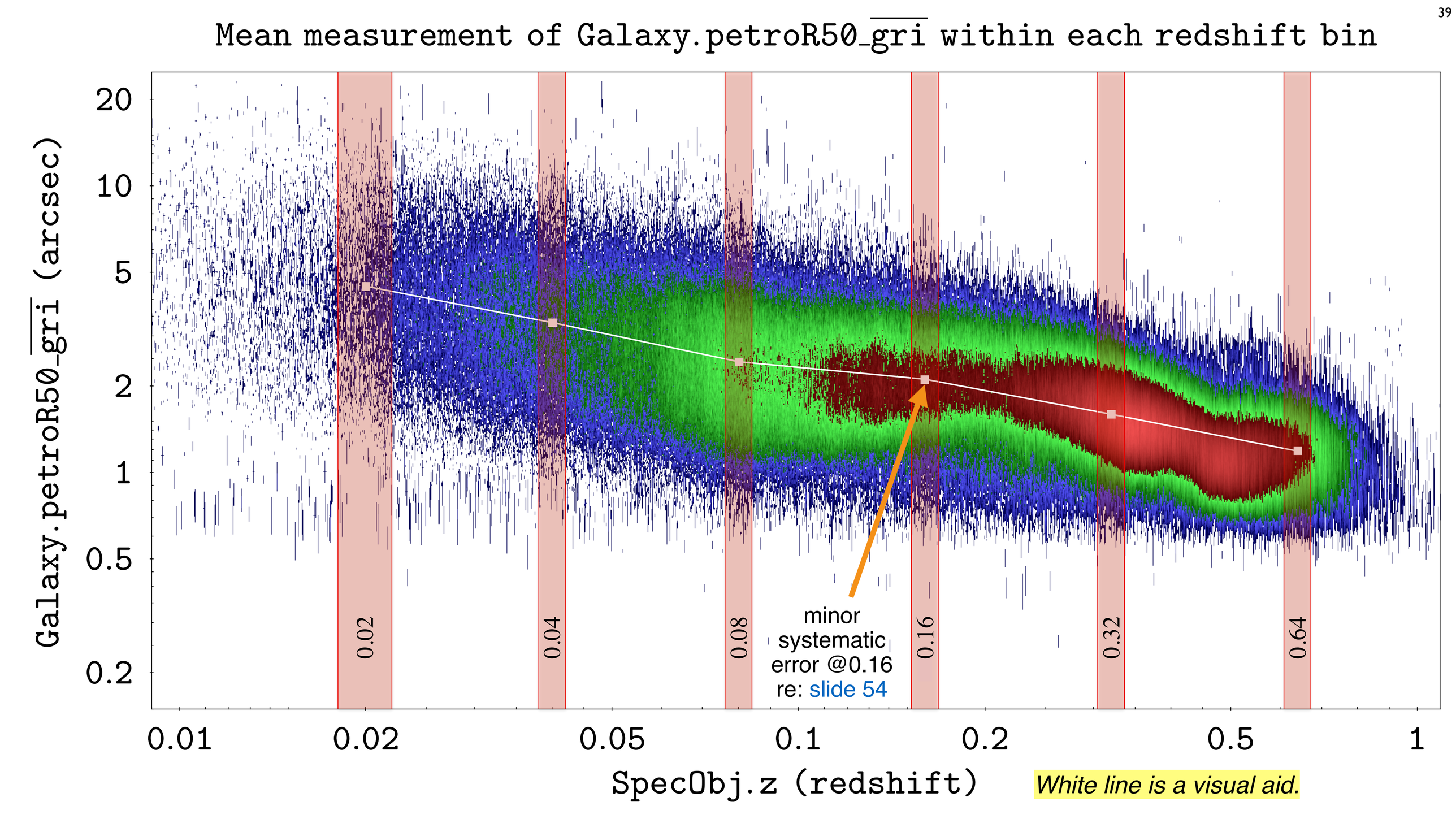
$\sim 719 \times 10^3$ galaxies plotted



Empirical inference

①

The *intrinsic* radial size of *typical* galaxies, including all morphologies, varies by about one order of magnitude (i.e., $\times 10$). That decadal range excludes the statistically-unlikely outliers.


Mean measurement of Galaxy.petroR50_gri within each redshift bin
Galaxy.petroR50_gri (arcsec)
20
10
5
2
1
0.5
0.2
0.01
0.02
0.05
0.1
0.2
0.5
1
SpecObj.z (redshift)
0.02
0.04
0.08
0.16
0.32
0.64
minor
systematic
error @0.16
re: slide 54
White line is a visual aid.

Quantitative analysis of galaxy-size statistical distribution ($z = 0.08$)

```
SELECT
  ROUND(AVG(z), 3) AS AVGz
, ROUND(AVG((petroR50_g + petroR50_r + petroR50_i) / 3), 2) AS ArithMean
, ROUND(STDDEV((petroR50_g + petroR50_r + petroR50_i) / 3), 2) AS StdDev
, ROUND(AVG(LN((petroR50_g + petroR50_r + petroR50_i) / 3)), 4) AS mu
, ROUND(STDDEV(LN((petroR50_g + petroR50_r + petroR50_i) / 3)), 4) AS sigma
, COUNT(1) AS n

...
```

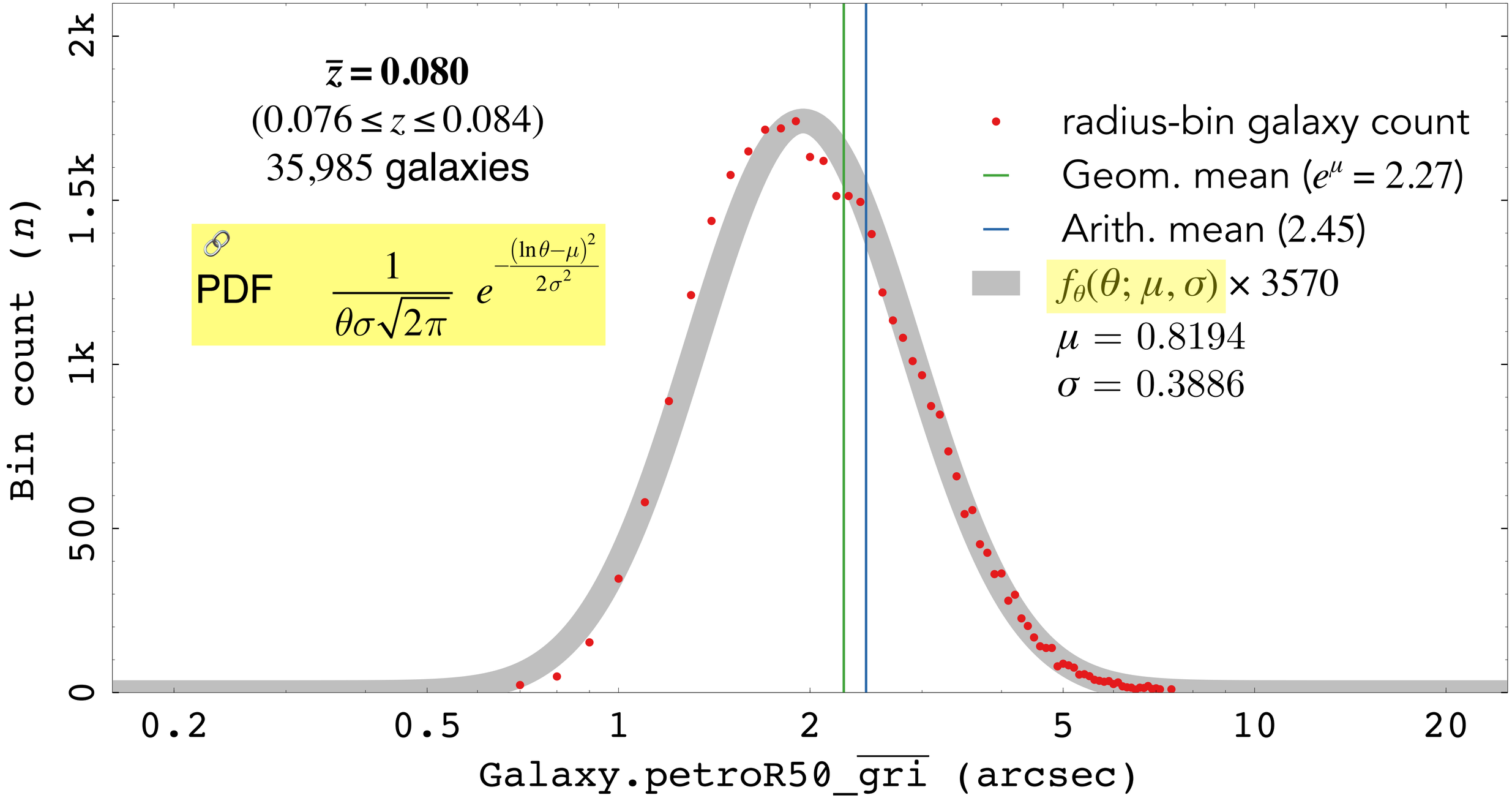
Append to _gri WHERE clause:

```
AND s.z BETWEEN 0.076 AND 0.084 -- z = 0.08 bin
```
(See * on slide 43 for other z-bins.)

AVGz	ArithMean	StdDev	mu	sigma	n
0.080	2.45	1.01	0.8194	0.3886	35985

Data for all bins shown on slide 44.

Empirical distribution vs. log-normal probability density function (PDF)

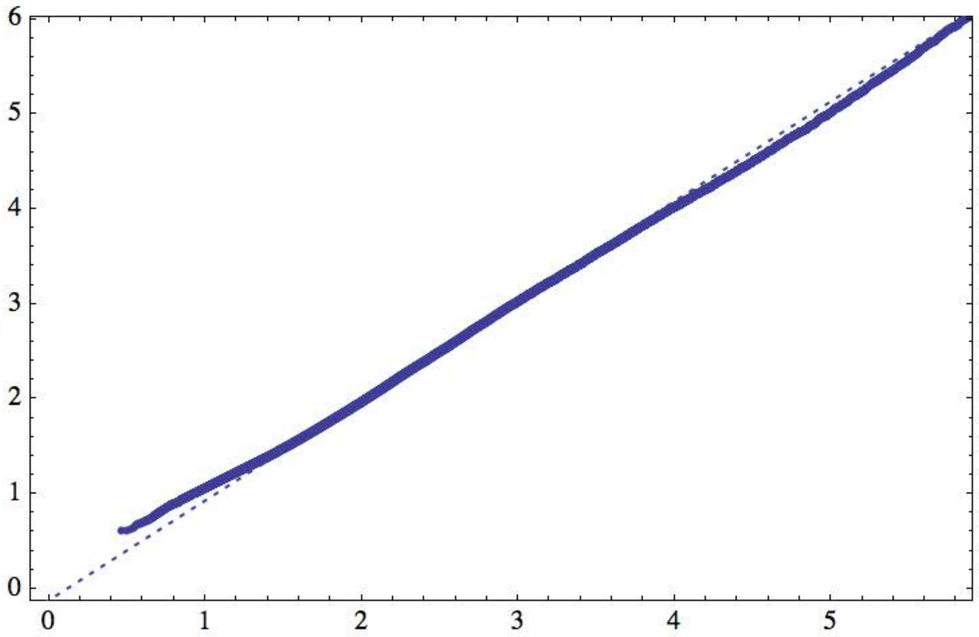


QQ plot confirmation of log-normal galaxy-size distribution

QQ Plot.nb

```
In[1]:= (* QQ plot to check log-normal distribution of redshift bin 0.08 *)

In[2]:= μ = 0.8194;

In[3]:= σ = 0.3886;

In[4]:= Import["/Users/alex/IWARA2018/AVGpetroR50_gri_Bin008.csv", "List"];

In[5]:= QuantilePlot[%, LogNormalDistribution[μ, σ]]
```

Out[5]=



Wolfram Mathematica

200%

SQL for QQ plot

```
SELECT
 (petroR50_g + petroR50_r + petroR50_i) / 3), 2) AS petroR50_gri

...
```

* Append to _gri WHERE clause:

```
-- Uncomment one line, below, to choose that bin for analysis.
-- AND s.z BETWEEN 0.018 AND 0.022 -- z = 0.02 bin
-- AND s.z BETWEEN 0.038 AND 0.042 -- z = 0.04 bin
AND s.z BETWEEN 0.076 AND 0.084 -- z = 0.08 bin
-- AND s.z BETWEEN 0.152 AND 0.168 -- z = 0.16 bin
-- AND s.z BETWEEN 0.304 AND 0.336 -- z = 0.32 bin
-- AND s.z BETWEEN 0.608 AND 0.672 -- z = 0.64 bin
```

Jump back to slide 40.

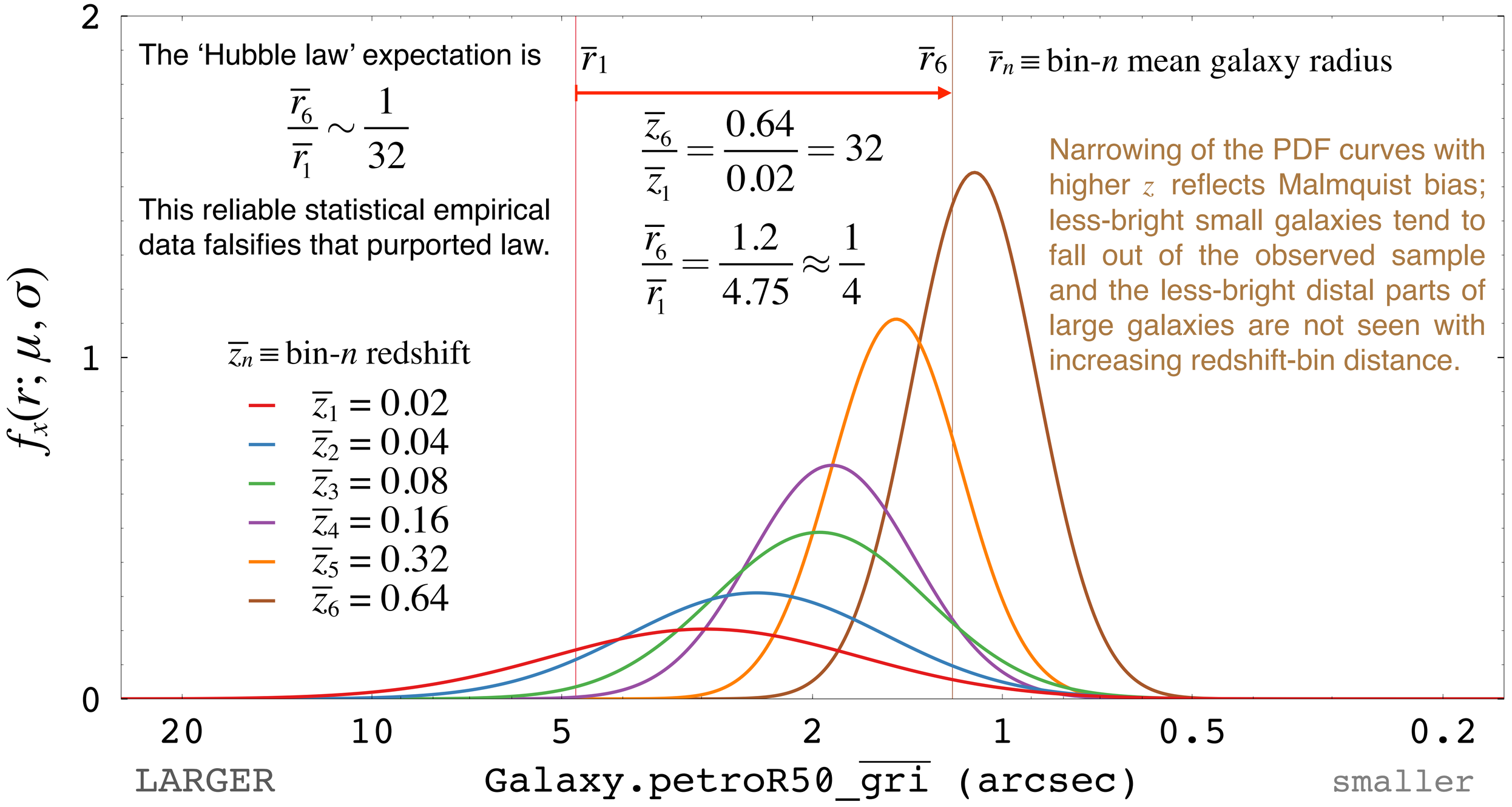
Quantitative analysis of galaxy-size statistical distribution (all z-bins)…

Average Redshift	Arithmetic Mean				Galaxies
$\bar{z}$	Radius ($\bar{r}_n$)	StdDev	$\mu \ln(r)$	$\sigma \ln(r)$	Bin count (n)
0.020	4.75″	2.83″	1.4014	0.5627	3,186
0.040	3.41″	1.68″	1.1178	0.4688	7,834
0.080	2.45″	1.01″	0.8194	0.3886	35,985
0.160	2.13″	0.66″	0.7114	0.2994	32,942
0.320	1.60″	0.39″	0.4436	0.2367	34,769
0.636	1.20″	0.28″	0.1533	0.2278	7,036

Jump back to slide 40.

This slide updated 31 Aug. 2022 (formatting).

Quantitative analysis of galaxy-size statistical distribution (all z-bins)



Empirical inference

②

Galaxies have a log-normal size distribution, which is clearly observable over a wide range of redshift.

Empirical inference

③

To *good approximation*, the mean apparent galaxy size in each redshift bin can be expected to represent the same standard rod (i.e., to be very nearly the same *intrinsic* size). To assume otherwise would require some unphysical ad hoc explanation.

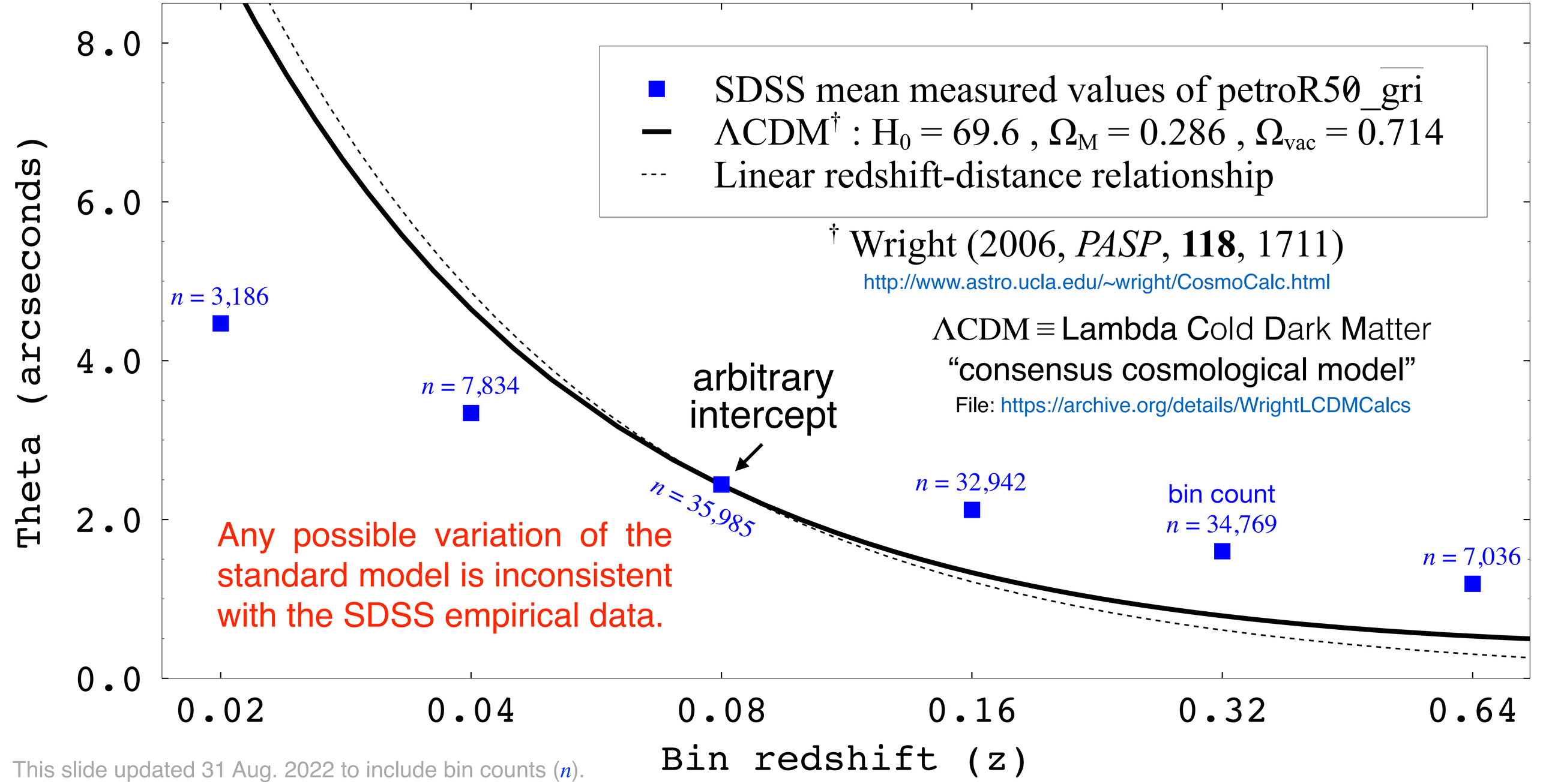
With a sample population across six redshift bins of $\sim 122\mathrm{k}$ galaxies, an increase in redshift of $32\times$ (z: $0.02 \rightarrow 0.64$) is correlated to a smooth and continuous decrease in mean apparent half-light radius of about $4\times$. This is eight times less than expected as per the ‘Hubble law’ predictive model.

"And where science gets *tough*, tough in the sense that you can be wrong, even if you passionately believe something, is that a good scientific theory makes predictions and those predictions can be tested."

🔗 Online Lecture: *The Nature of Space and Time* (1:05:50 / 1:28:25)

– Lee Smolin, *Perimeter Institute for Theoretical Physics*

Mean half-light (R50) radius measurements in six redshift bins



This slide updated 31 Aug. 2022 to include bin counts (*n*).

Let's be clear about what that graph means, as it is non-trivial:

First, we confirm that the empirical SDSS theta-z data is objective and that there is no systematic error or any other problem that invalidates logical inferences that may be drawn from that data.

The graph means that the empirical redshift-distance relationship is inconsistent with the 'Hubble law.' If that is true, then the Universe is not expanding, regardless of what we may *believe* or want to believe. The data is unambiguous; it is based on $\sim 2 \times 10^6$ objective high-quality measurements that are not affected by confirmation bias.

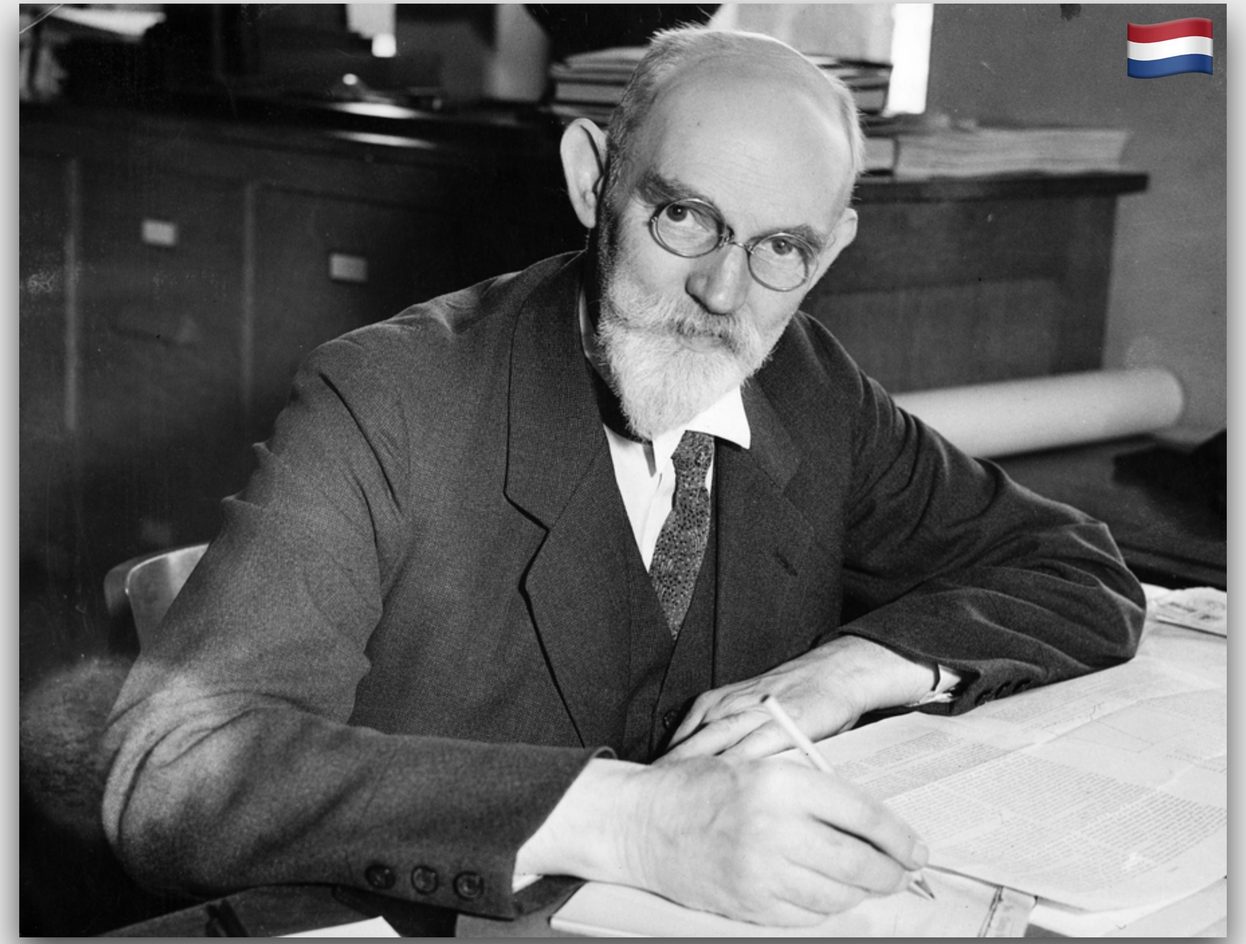
Accordingly, we have a major *scientific crisis* (confirmed by several other independent, corroborating empirical observations, shown later). To find a resolution, there is only one place to look for guidance…

The Einstein Field Equations

$$G_{\mu\nu} + \Lambda g_{\mu\nu} = 8\pi T_{\mu\nu}$$

(The physical constants are normalized.)

Willem de Sitter (6 May 1872 – 20 Nov 1934) was a Dutch mathematician, physicist, and astronomer.



publications link
dwc.knaw.nl ⇨

dwc KNAW Digital Library

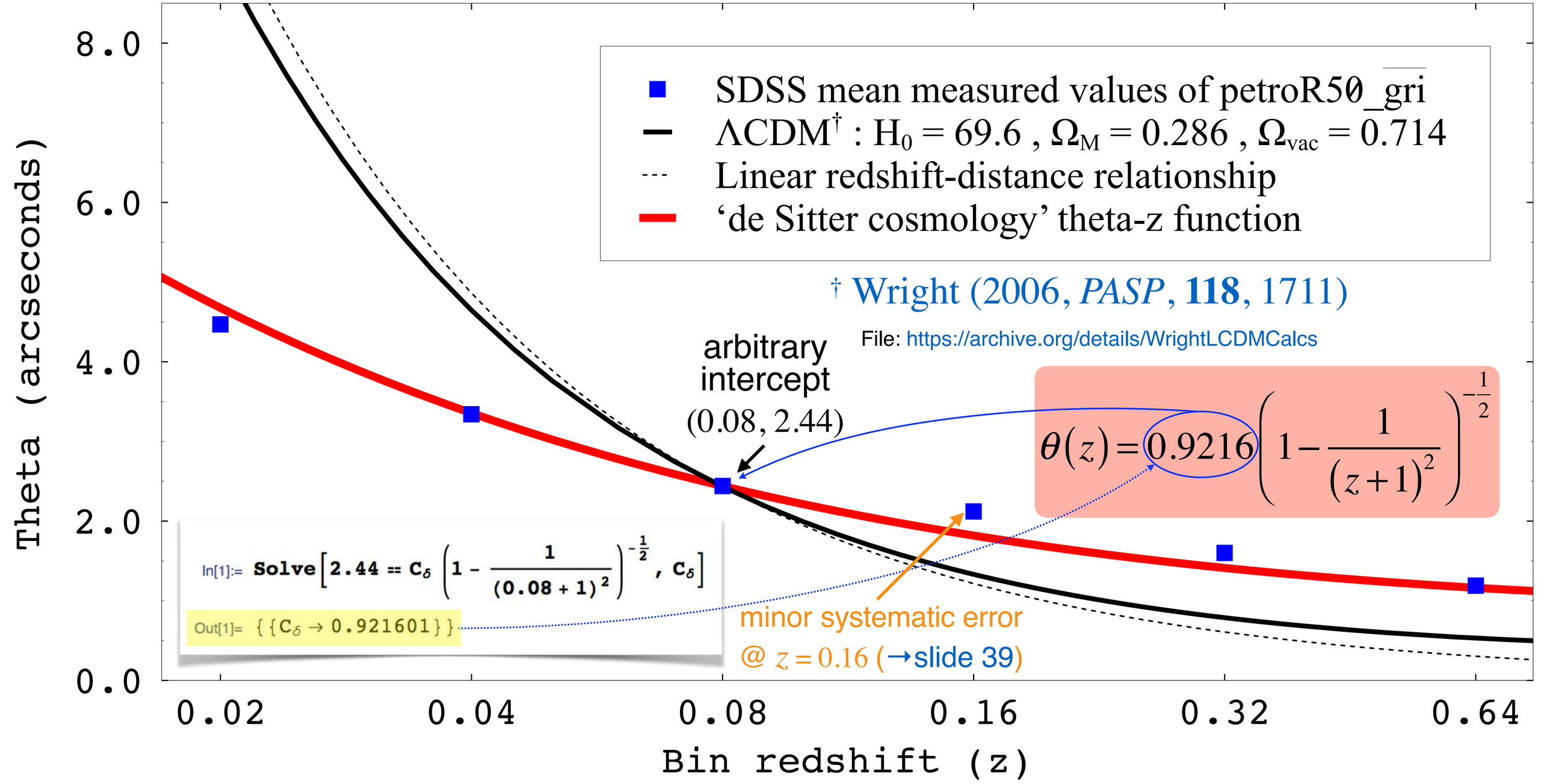
In a nutshell, we go back to Willem de Sitter's exact solution to the Einstein field equations (EFE) circa 1917 and gain a clear and rational understanding of its *physical interpretation*, which new interpretation *supersedes* that of the Einstein-de Sitter debate.[1] This leads to the derivation of a new set of predictive formulas, which rest on first principles and are consistent with the EFE. Among these formulas is:

$$\theta(z) = C_\delta \left(1 - \frac{1}{(z+1)^2} \right)^{-\frac{1}{2}} \quad \text{radians}$$

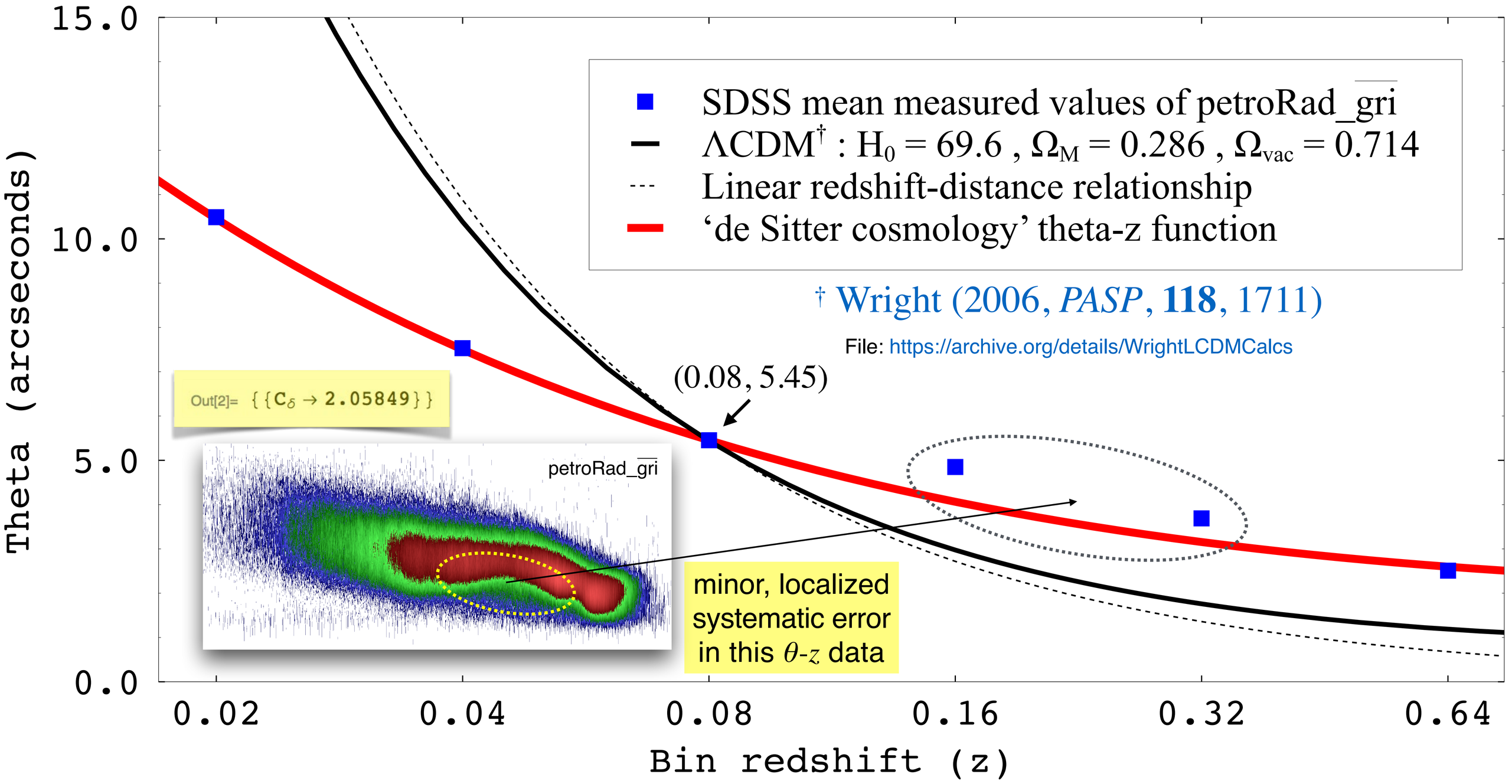
C_δ is an arbitrary *scaling* constant that is proportional to the intrinsic diameter (δ) of the astrophysical standard rod under consideration. Thus, changing C_δ *shifts* the predictive curve up or down to match an arbitrary object size, but it does not modify that curve in any way: With regard to relative measurements, *there are no free parameters in any of the new predictive formulas*. For absolute measurements, the single shared free parameter is the estimated Cosmic radius R.

1. C. O'Raifeartaigh, M. O'Keeffe, W. Nahmb and S. Mitton, "Einstein's cosmology review of 1933: a new perspective on the Einstein-de Sitter model of the cosmos," *Euro. Phys. J. H.* **40**, 301 (2015); arXiv:1503.08029 [physics.hist-ph].

Mean half-light (R50) radius measurements in six redshift bins



Mean Petrosian radius measurements in six redshift bins



Let's be clear about what the red curves on the prior two slides mean, as it is non-trivial:

As an accurate predictive model of empirical observations, they mean that the Universe is *not* expanding, regardless of what we may *believe* or want to believe. Over a century ago, de Sitter *unequivocally* pursued the right idea (galaxy redshifts are caused by cosmological spacetime geometry and not by expansion-induced recession). However, he did not adequately interpret (and further develop) his own mathematics.

In light of July 2022 JWST images, *read that again*.

This slide updated 31 Aug. 2022.

Quoted from Edwin Hubble's last paragraph; *PNAS* **15**, 168 (1929)

The outstanding feature, however, is the possibility that the velocity-distance relation may represent the de Sitter effect, and hence that numerical data may be introduced into discussions of the general curvature of space. … it may be emphasized that the linear relation found in the present discussion is a first approximation representing a restricted range in distance.

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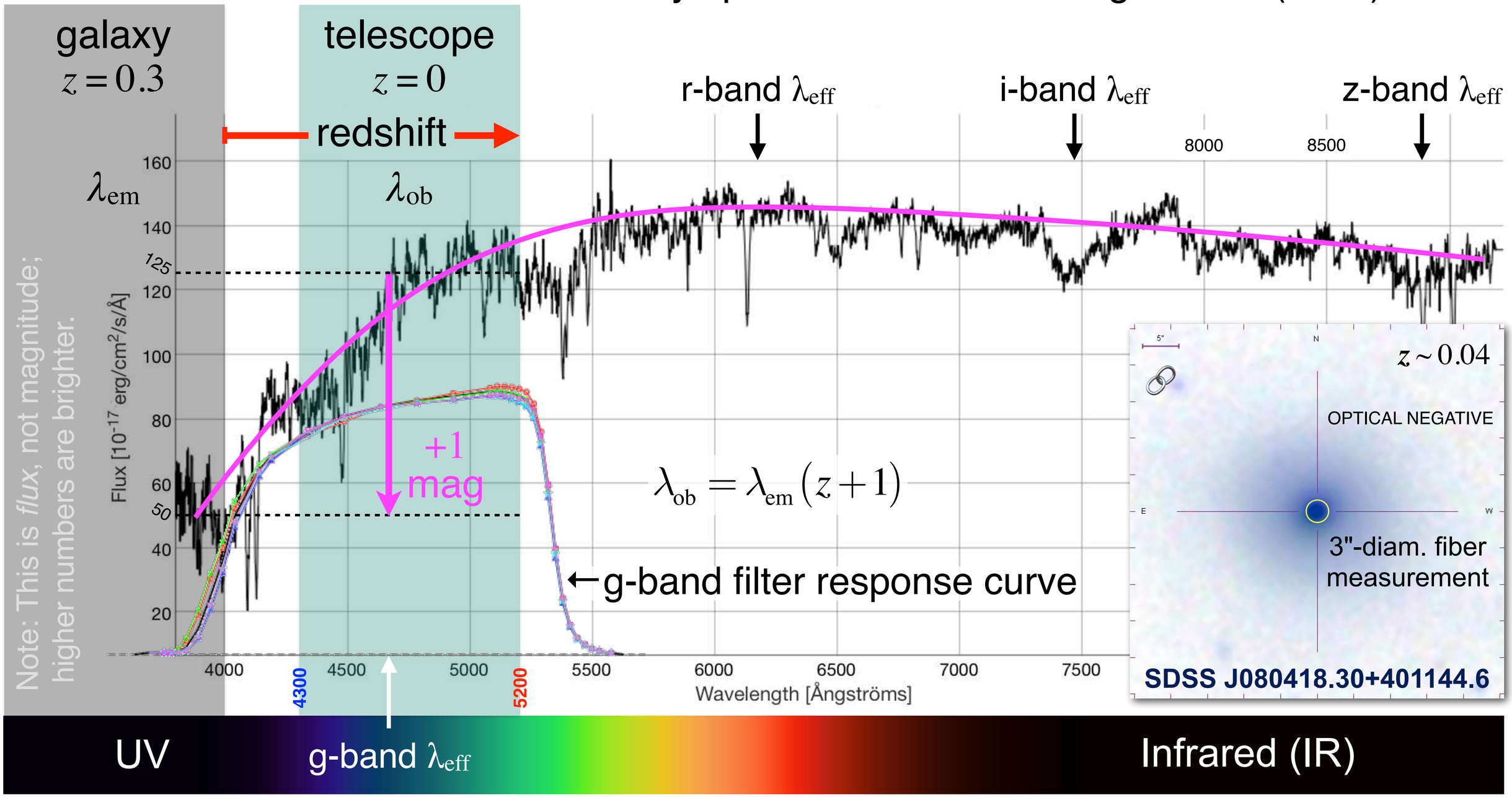
Galaxy spectrum demonstrating 4000-Å (Ca II) break



Follow the data…

According to conventional thinking in cosmology, the idea that a class of standard-candle galaxies might exist may seem to be a “wild hypothesis” that is inconsistent with what are assumed to be ‘known facts,’ so confusion and misunderstanding are to be expected. However, those problems can be resolved:

If a class of cosmic object is observed to trace the known K-correction curve over redshift, then, *by definition*, that class of object *must* be a standard candle. Confronted with such empirical data, one is not “hypothesizing” the existence of a galactic standard candle, one is *objectively observing* the phenomenon.

The statistical (fuzzy)[1] baseline of the SDSS redshift-magnitude measurements represents the class of brightest galaxies (Petrosian magnitudes for an entire galaxy or their nuclei as measured to good approximation by the spectrograph fiber magnitudes). If that baseline traces the K-correction curve, then we may infer with complete certainty that those objects are also a class of standard candle, without regard for any redshift-magnitude model.

SO, LET US FOLLOW THE *RELIABLE* SDSS DATA AND SEE WHERE IT LEADS…

1. R. Viertl, *Statistical Methods for Fuzzy Data* (Wiley, Chichester, 2011).

SDSS glossary reference

If you jumped here, click to go back to *Fixed-aperture fiber magnitudes*…

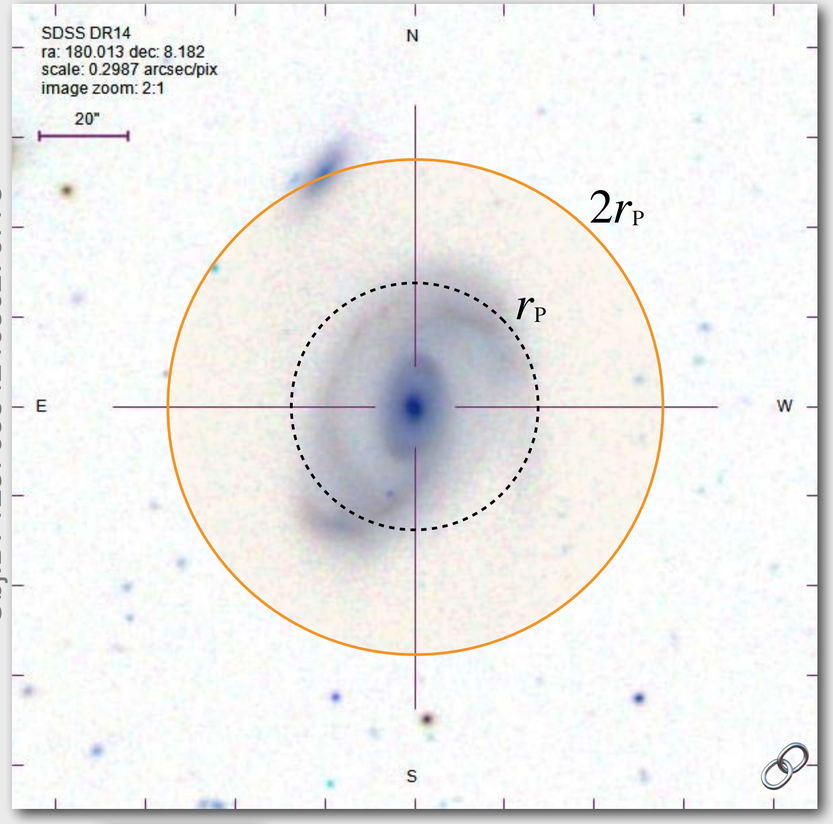
Magnitude, Petrosian

Stored as `petroMag`. For galaxy photometry, measuring flux is more difficult than for stars, because galaxies do not all have the same radial surface brightness profile, and have no sharp edges. In order to avoid biases, we wish to measure a constant fraction of the total light, independent of the position and distance of the object. To satisfy these requirements, the SDSS has adopted a modified form of the Petrosian (1976) system, measuring galaxy fluxes within a circular aperture whose radius is defined by the shape of the azimuthally averaged light profile. Details can be found in the Photometry section of the Algorithms pages and the Strauss et al. (2002) AJ paper on galaxy target selection. Model magnitudes share most of the advantages of Petrosian magnitudes, and have higher S/N; they are therefore used instead of Petrosian magnitudes for target selection in BOSS.

Source: https://www.sdss.org/dr14/help/glossary/#M

DEFINITION: “Petrosian flux”

$$F_{\mathrm{P}} \equiv \int_0^{N_{\mathrm{P}} r_{\mathrm{P}}} \mathrm{d}r' 2\pi r' I(r') \quad \left[N_{\mathrm{P}} = 2.0\right]$$



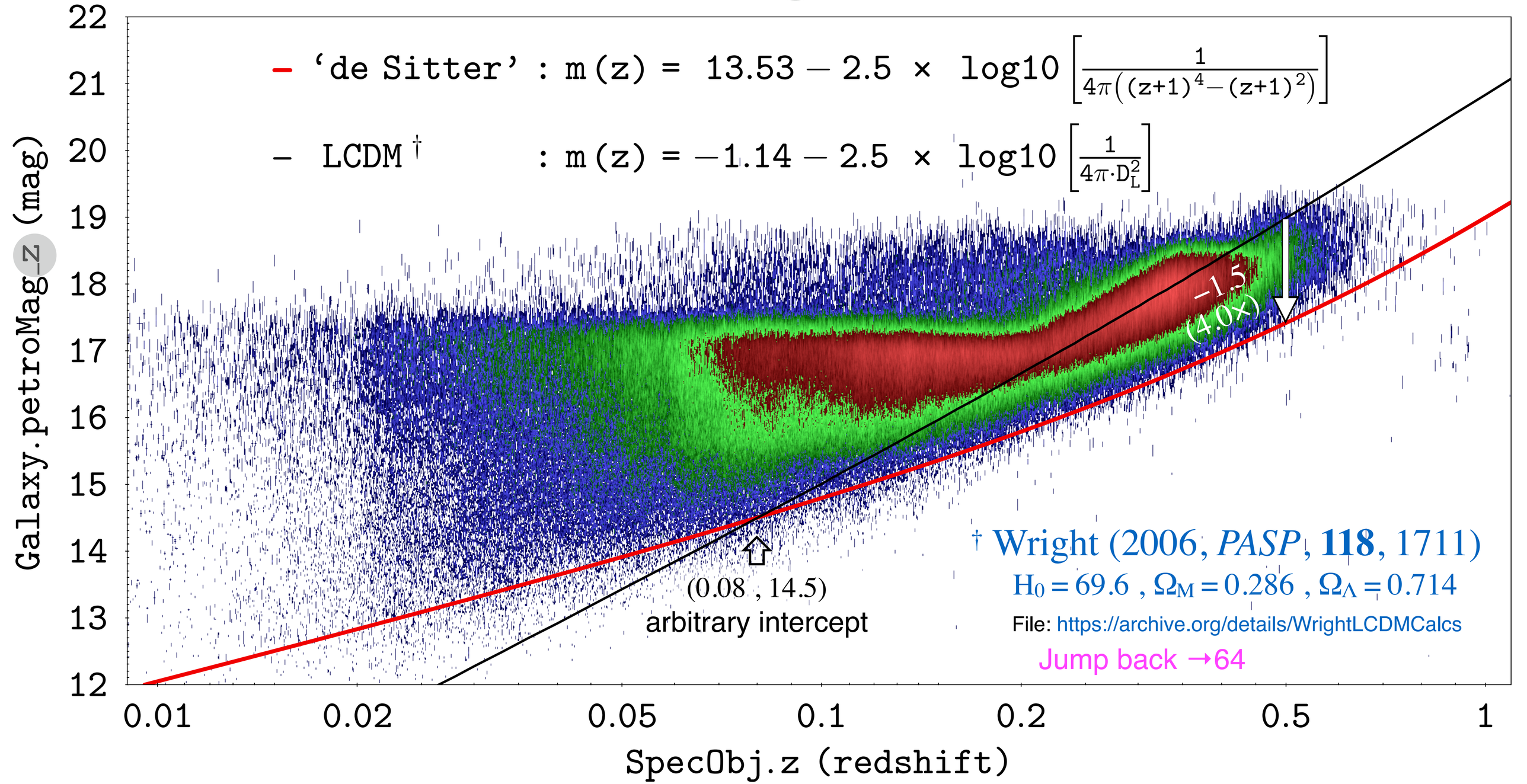
r′-band petroRad_r: $r_{\mathrm{P}} = 27.5''$

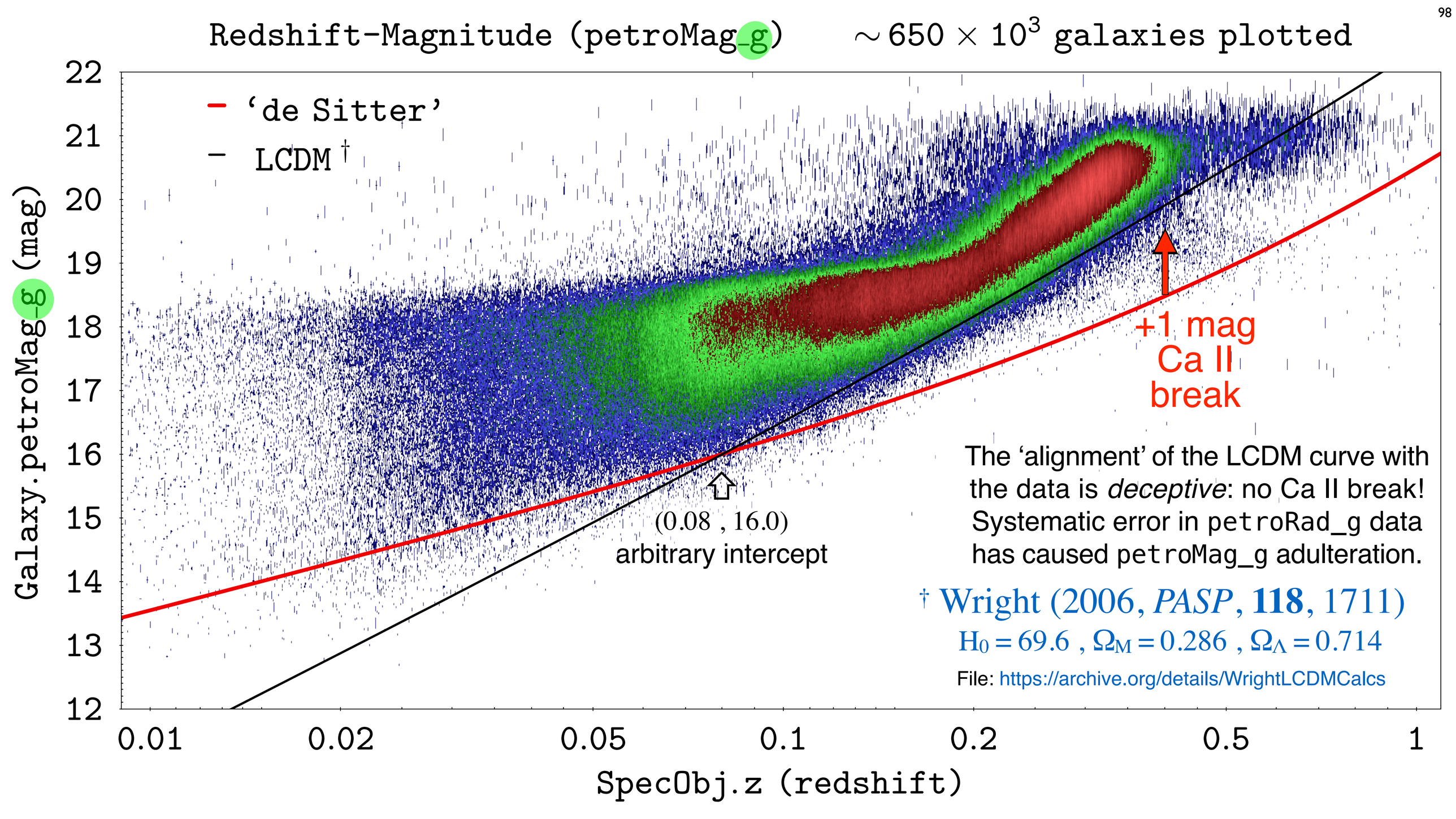
The SDSS Petrosian flux in any band is defined as the flux within two Petrosian radii ($2r_{\mathrm{P}}$).

“In the SDSS five-band photometry, the aperture in all bands is set by the profile of the galaxy in the r band alone. This procedure ensures that the color measured by comparing the Petrosian flux F_{P} in different bands is measured through a consistent aperture.”

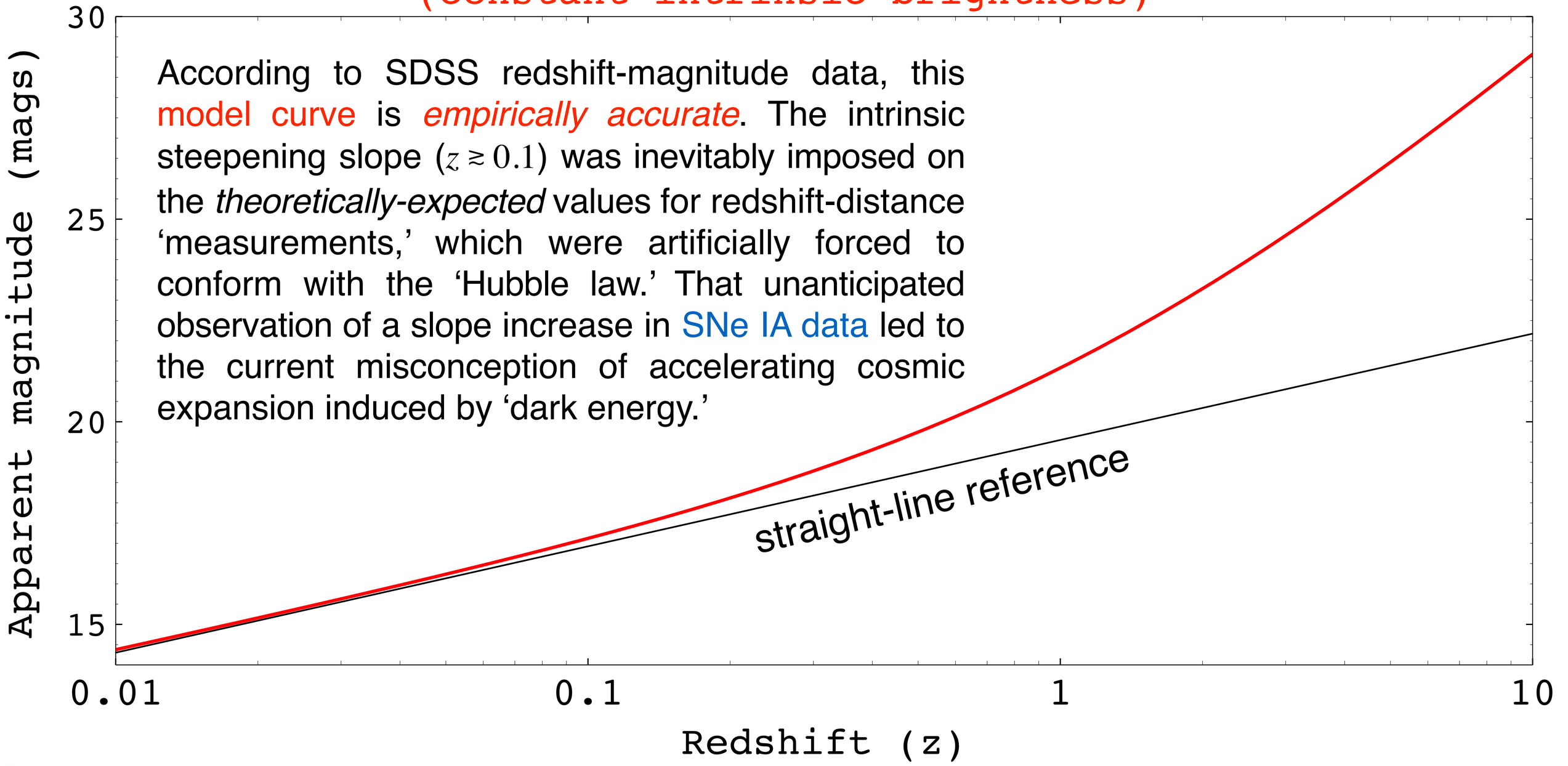
Reference: https://www.sdss.org/dr14/algorithms/magnitudes/#mag_petro

Redshift-Magnitude (petroMag_z) ~ 620 × 10³ galaxies plotted




Redshift-Magnitude (petroMag_g)
~650 × 10^3 galaxies plotted
'de Sitter'
LCDM †
+1 mag
Ca II
break
(0.08 , 16.0)
arbitrary intercept
The 'alignment' of the LCDM curve with the data is *deceptive*: no Ca II break! Systematic error in petroRad_g data has caused petroMag_g adulteration.
† Wright (2006, *PASP*, **118**, 1711)
H0 = 69.6 , ΩM = 0.286 , ΩΛ = 0.714
File: https://archive.org/details/WrightLCDMCalcs
Galaxy.petroMag_g (mag)
SpecObj.z (redshift)
22
21
20
19
18
17
16
15
14
13
12
0.01
0.02
0.05
0.1
0.2
0.5
1

‘de Sitter’ model redshift-magnitude curve
(constant intrinsic brightness)



According to SDSS redshift-magnitude data, this model curve is *empirically accurate*. The intrinsic steepening slope ($z \approx 0.1$) was inevitably imposed on the *theoretically-expected* values for redshift-distance ‘measurements,’ which were artificially forced to conform with the ‘Hubble law.’ That unanticipated observation of a slope increase in SNe IA data led to the current misconception of accelerating cosmic expansion induced by ‘dark energy.’

This slide updated 31 Aug. 2022 (grammatical improvement).

W. de Sitter,
"Einstein's theory of gravitation and its astronomical consequences. Third paper,"
MNRAS **78**, 3 (1917).

Also see the 1918 *KNAW* paper covering a 30 June 1917 lecture on the next slide (quoted reference).

If we neglect all pressures and other internal forces, and if we suppose all matter to be at rest, then the tensor $T_{\mu\nu}$ becomes

(5) $$T_{44} = g_{44}\rho, \qquad \text{all other } T_{\mu\nu} = 0,$$

ρ being the density in natural measure. We can put

(6) $$\rho = \rho_0 + \rho_1,$$

where ρ_0 is the average density of the world-matter. If ρ_0 is positive, then ρ_1 may be positive or negative; but in the latter case the numerical value must not exceed ρ_0.

If we wish to neglect gravitation, we must neglect ρ_1, and take ρ_0 constant. The equations (3) then become

(7) $$\begin{cases} G_{ij} - (\lambda + \frac{1}{2}\kappa\rho_0)g_{ij} = 0. \\ G_{44} - (\lambda + \frac{1}{2}\kappa\rho_0)g_{44} = -\kappa\rho_0 g_{44}. \end{cases}$$

These can be satisfied by the $g_{\mu\nu}$ implied by the line-element

Einstein

(8A) $$ds^2 = -dr^2 - R^2 \sin^2\frac{r}{R}[d\psi^2 + \sin^2\psi d\theta^2] + c^2dt^2,$$

if

(9A) $$\kappa\rho_0 = 2\lambda, \qquad \lambda = \frac{1}{R^2}.$$

This is Einstein's new solution.

The equations are also satisfied by

de Sitter

(8B) $$ds^2 = -dr^2 - R^2 \sin^2\frac{r}{R}[d\psi^2 + \sin^2\psi d\theta^2] + \cos^2\frac{r}{R}c^2dt^2,$$

if

(9B) $$\rho_0 = 0, \qquad \lambda = \frac{3}{R^2};$$

Another exact solution to the field equations

$$\mathrm{d}s^2 = -\mathrm{d}r^2 - R^2 \sin^2\left(\frac{r}{R}\right)\left[\mathrm{d}\psi^2 + \sin^2(\psi)\,\mathrm{d}\theta^2\right] + \cos^2\left(\frac{r}{R}\right)c^2\mathrm{d}t^2$$

"…we have $\varrho_0 = 0$ and consequently all $T_{\mu\nu} = 0$."

$\varrho_0 \equiv$ "average matter density"

– Willem de Sitter (30 June 1917)

A Universe with '*zero average* density' (i.e., *net zero* energy) seems absurd—or is it?

W. de Sitter, "On the curvature of space," *KNAW Proceedings* **20**(1), 229 (1918).

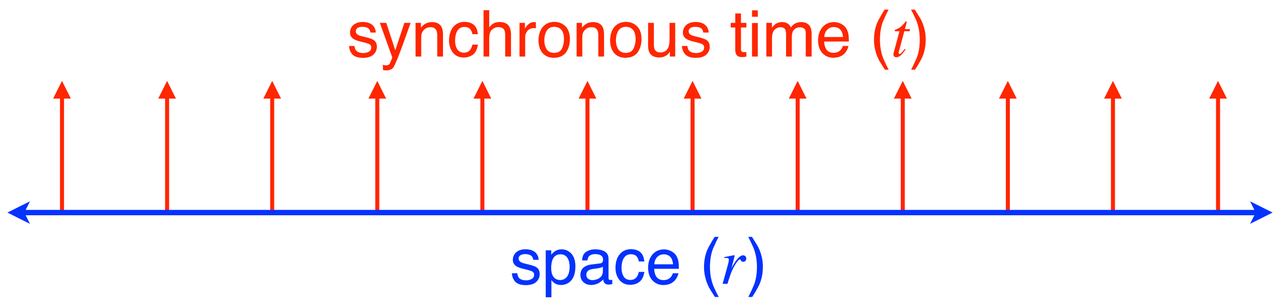
Distance-induced time dilation [$f(r)$] in the de Sitter-metric

$$\mathrm{d}s^2 = -\cancelto{0}{\mathrm{d}r^2} - R^2 \sin^2\left(\frac{r}{R}\right)\left[\cancelto{0}{\mathrm{d}\psi^2} + \sin^2(\psi)\,\cancelto{0}{\mathrm{d}\theta^2}\right] + \cos^2\left(\frac{r}{R}\right)c^2\mathrm{d}t^2$$

$$\mathrm{d}s^2 \equiv \mathrm{d}\tau^2 = \cos^2\left(\frac{r}{R}\right)c^2\mathrm{d}t^2 \qquad \underbrace{(R = c = 1)}_{\text{normalized}}$$

$$\frac{\mathrm{d}t}{\mathrm{d}\tau} = \frac{1}{\cos r}$$

The distinct physical interpretations of Einstein's and de Sitter's "g_{44}" *



$+c^2\mathrm{d}t^2$

Einstein

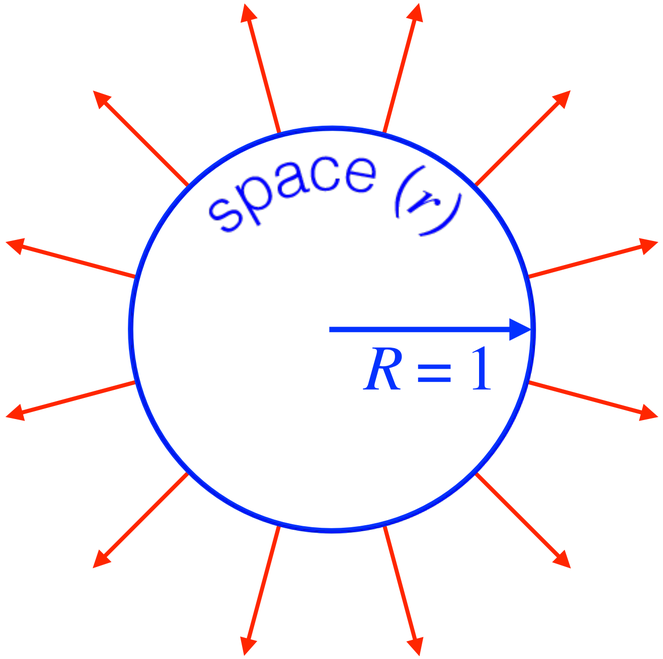
animation…

* (by modern convention, now "g_{00}")

The distinct physical interpretations of Einstein's and de Sitter's "g_{44}"*

Note that this model derives independently of the EFE from symmetry (i.e., the 3-sphere) and local orthogonality of space and time (Minkowski).

asynchronous time $[\tau(r)]$



animation completed

View the animation (YouTube)
https://youtu.be/kswjXqnNEs0

Change quality to 1080p.

$t \equiv \tau(0)$

$$+\cos^2\left(\frac{r}{R}\right)c^2\mathrm{d}t^2$$

de Sitter

* (by modern convention, now "g_{00}")

Time reversal and energy polarity

An idea arising from mathematical physics, which involves symmetry and the Planck equation ($E = h\nu$), is that *time reversal* yields *negative energy*.

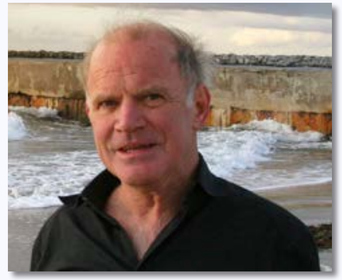
From any observer's arbitrary location in the Cosmos, local proper time in the fundamentally-invisible antipodal volumetric half of the Universe is systemically (i.e., azimuthally averaged) *relativistically reversed* as compared to local proper time in the adjacent visible half, which is bounded by the cosmological redshift horizon (see next slide).

The average matter density of both halves (A, B) is equal, so the two energy *magnitudes* are equal: $|E_A| = |E_B|$. However, *relativistically*, $E_A = -E_B$; therefore *the net cosmic energy is zero*: $E_A + E_B = 0$.

A remarkably-insightful speculation dating back fifty years was on the right track!

K. Mullis, "Cosmological Significance of Time Reversal," *Nature* **218**, 663 (1968).

photo credit: Kent Clemenco

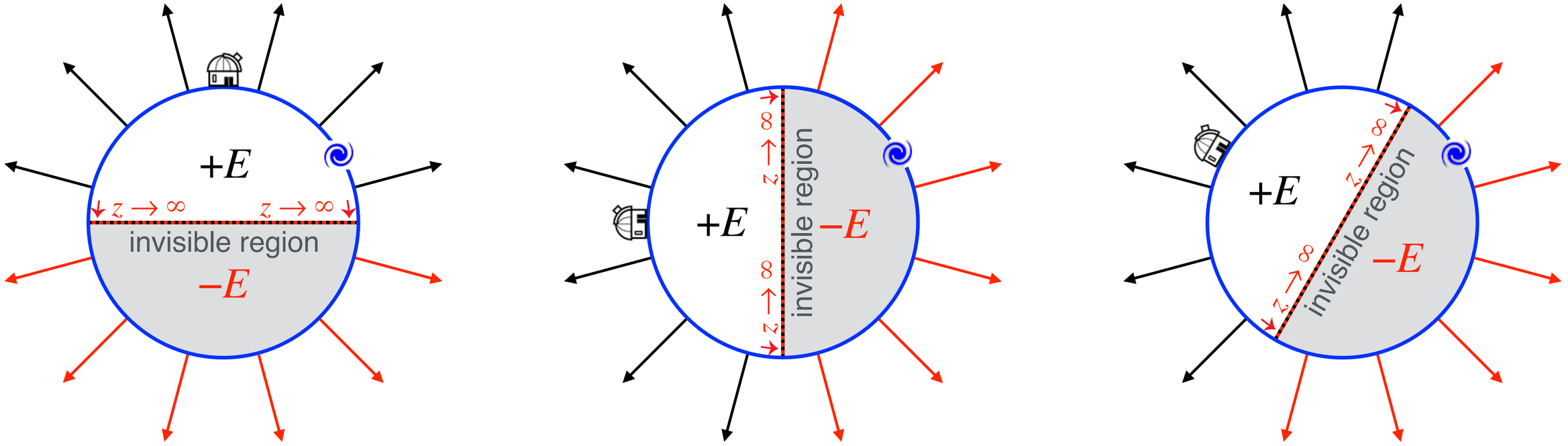


Kary Mullis

Cosmic antipodal energy polarity is a temporal *relativity* phenomenon.

Same galaxy, different observer location—radial arrows represent local proper time.

Locally, the laws of physics (e.g., the second law of thermodynamics) are identical.



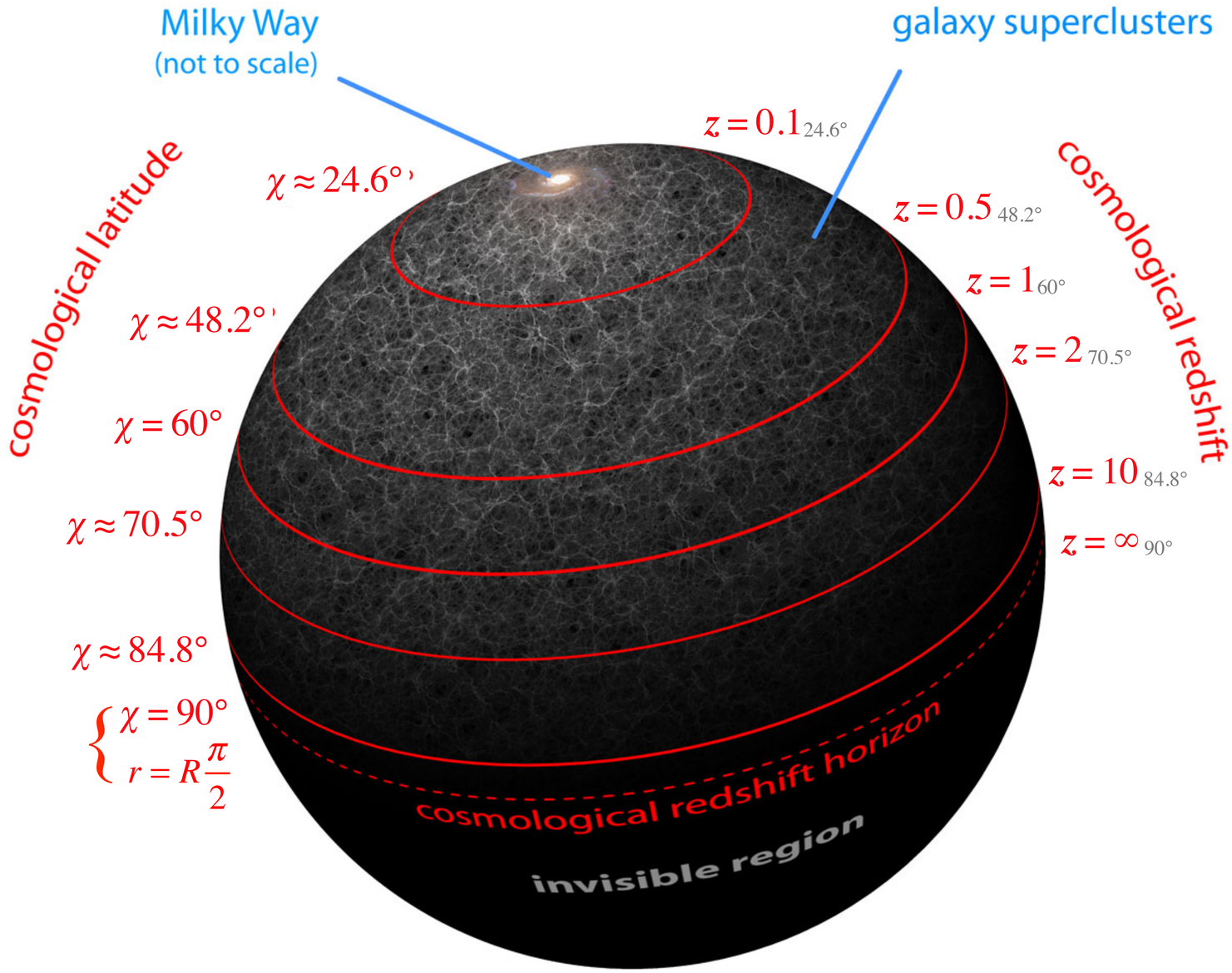
Relativistically, the *net* energy of the Universe is always *zero*: $(E - E = 0)$ from the point of view of an observer at any arbitrary Cosmic location.

© A. F. Mayer

A complete cosmological map of the $\mathbb{S}^2$ surface *locally* defined by Galactic latitude $b = 0$ (i.e., the Galactic plane)

$$\chi = \cos^{-1}\left(\frac{1}{z+1}\right)$$

$$z = \frac{1}{\cos\chi} - 1$$



$$r = R\cos^{-1}\left(\frac{1}{z+1}\right)$$

$z = \infty$
@ horizon
$(\chi = \pi/2)$

Graphic by Fabio Basile after an original rendering by Hollin Calloway (2005).

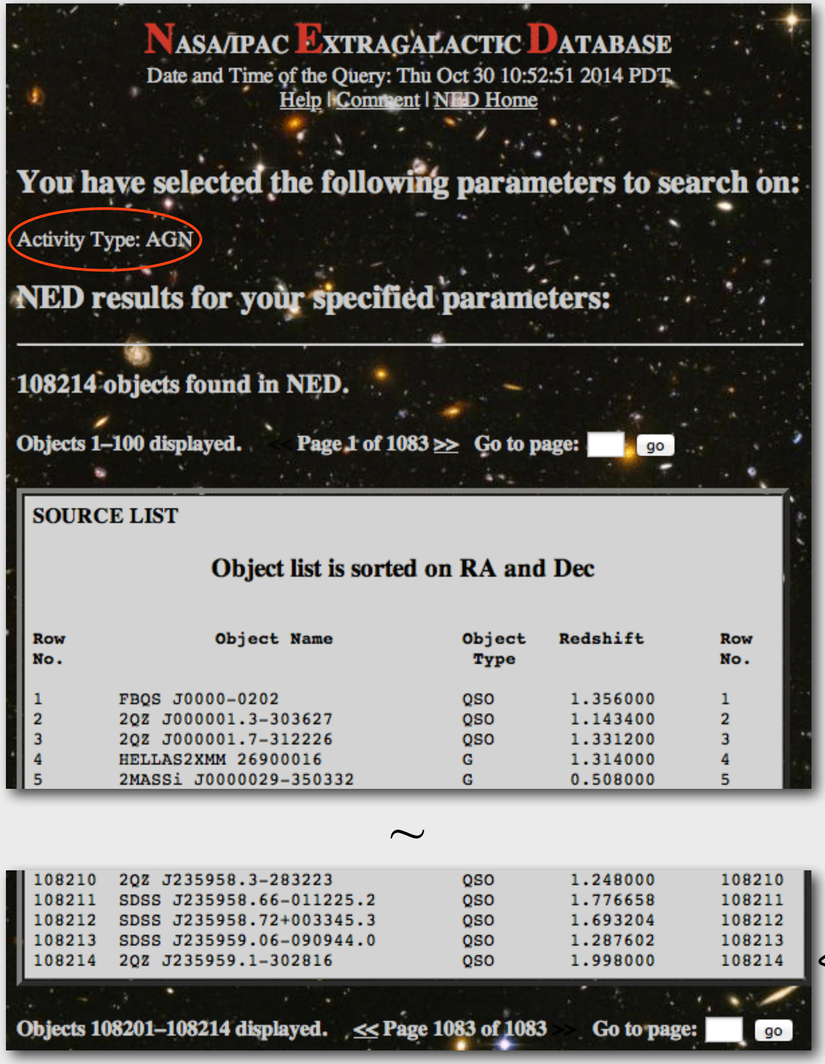
Space-density of active galactic nuclei

A small percentage of galaxies host an active galactic nucleus (AGN), which has a much higher luminosity than normal; the brightest AGN are observed at very high redshift ($z > 6$), so these galaxies are an ideal observable with which to confront theoretical predictions of galaxy space density, including testable assumptions concerning galaxy evolution over lookback time. According to the data and the new cosmological model, AGN constitute a fixed portion of the local regional galaxy population (on large scale) throughout the Universe. According to the ΛCDM model, AGN population density has increased by over four orders of magnitude since the presumed 'primordial universe.'

To counteract any survey selection effects, data for $\sim 108\text{k}$ AGN is sourced from the NASA/IPAC Extragalactic Database (NED); SDSS data constitutes about 72% of the graphed NED AGN dataset, with the balance sourced from numerous other surveys.

NED AGN

Click *image* for source data,
here for precompiled datafile.



NASA/IPAC EXTRAGALACTIC DATABASE

Date and Time of the Query: Thu Oct 30 10:52:51 2014 PDT

Help | Comment | NED Home

You have selected the following parameters to search on:

Activity Type: AGN

NED results for your specified parameters:

108214 objects found in NED.

Objects 1–100 displayed. Page 1 of 1083 >> Go to page: go

SOURCE LIST

Object list is sorted on RA and Dec

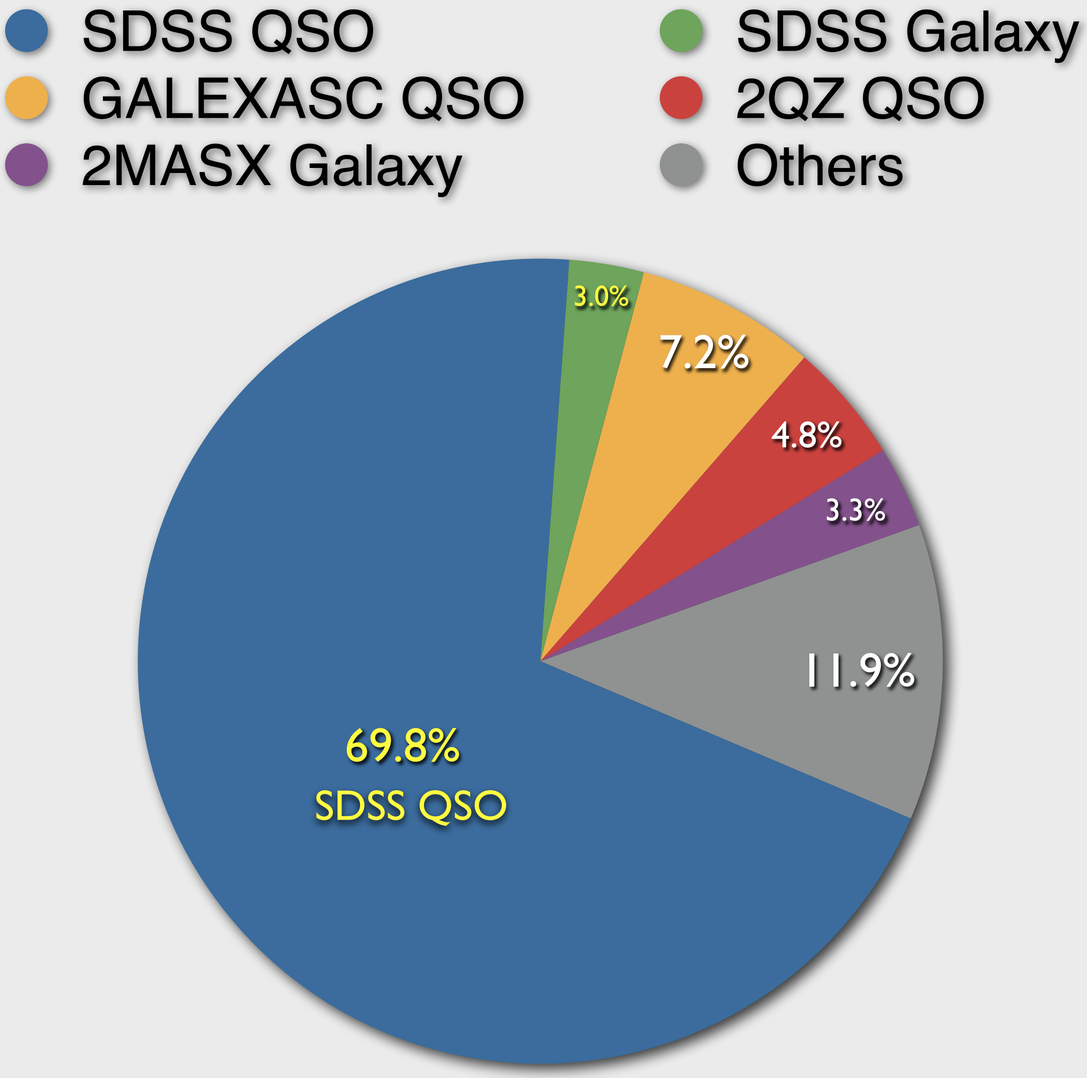
Row No.	Object Name	Object Type	Redshift	Row No.
1	FBQS J0000-0202	QSO	1.356000	1
2	2QZ J000001.3-303627	QSO	1.143400	2
3	2QZ J000001.7-312226	QSO	1.331200	3
4	HELLAS2XMM 26900016	G	1.314000	4
5	2MASSi J0000029-350332	G	0.508000	5

~

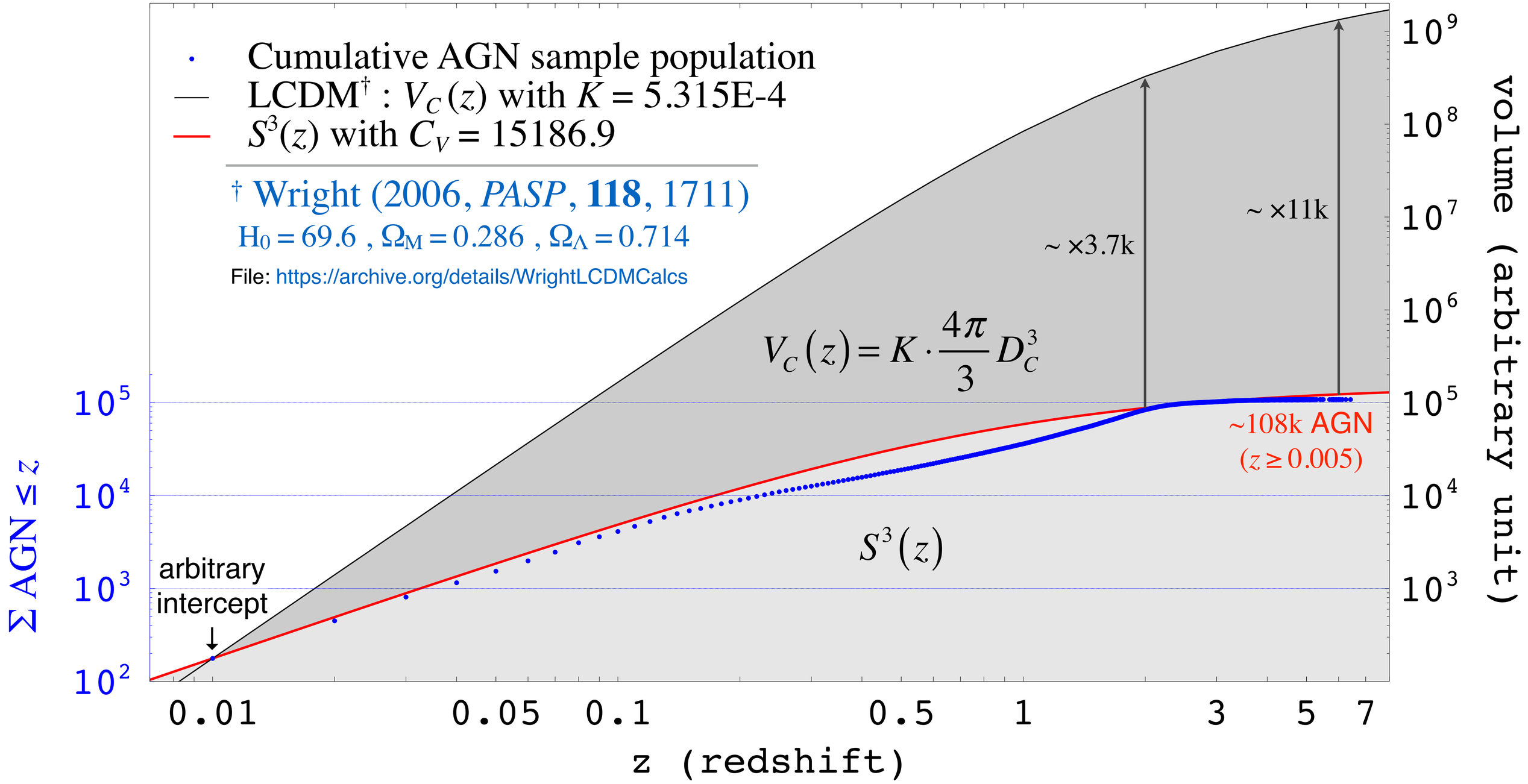
108210	2QZ J235958.3-283223	QSO	1.248000	108210
108211	SDSS J235958.66-011225.2	QSO	1.776658	108211
108212	SDSS J235958.72+003345.3	QSO	1.693204	108212
108213	SDSS J235959.06-090944.0	QSO	1.287602	108213
108214	2QZ J235959.1-302816	QSO	1.998000	108214

Objects 108201–108214 displayed. << Page 1083 of 1083 >> Go to page: go

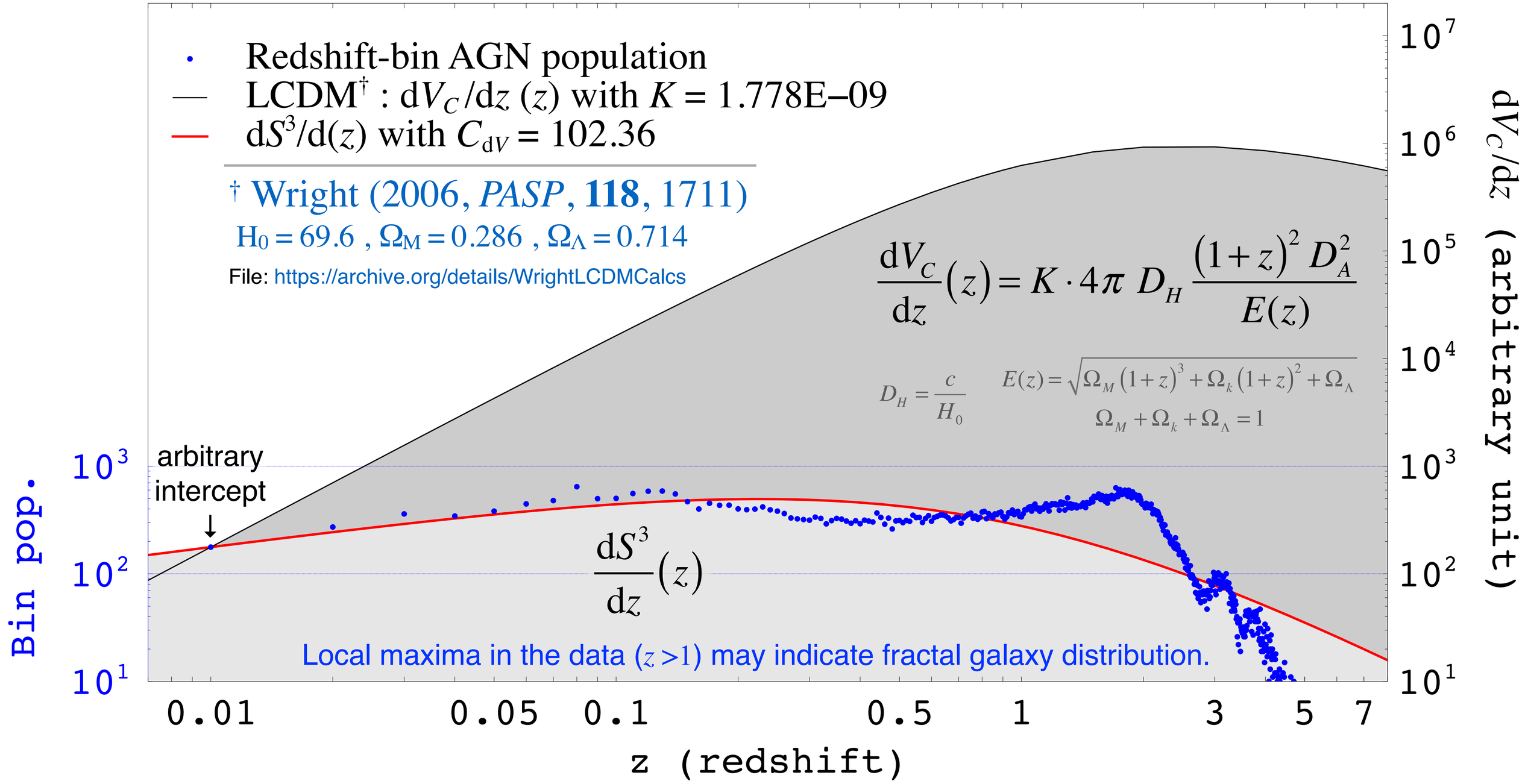
⟸108,214 AGN



Cumulative AGN population ($\sum \mathrm{AGN} \le z$) vs. volume models



AGN redshift-bin population vs. volume-element models

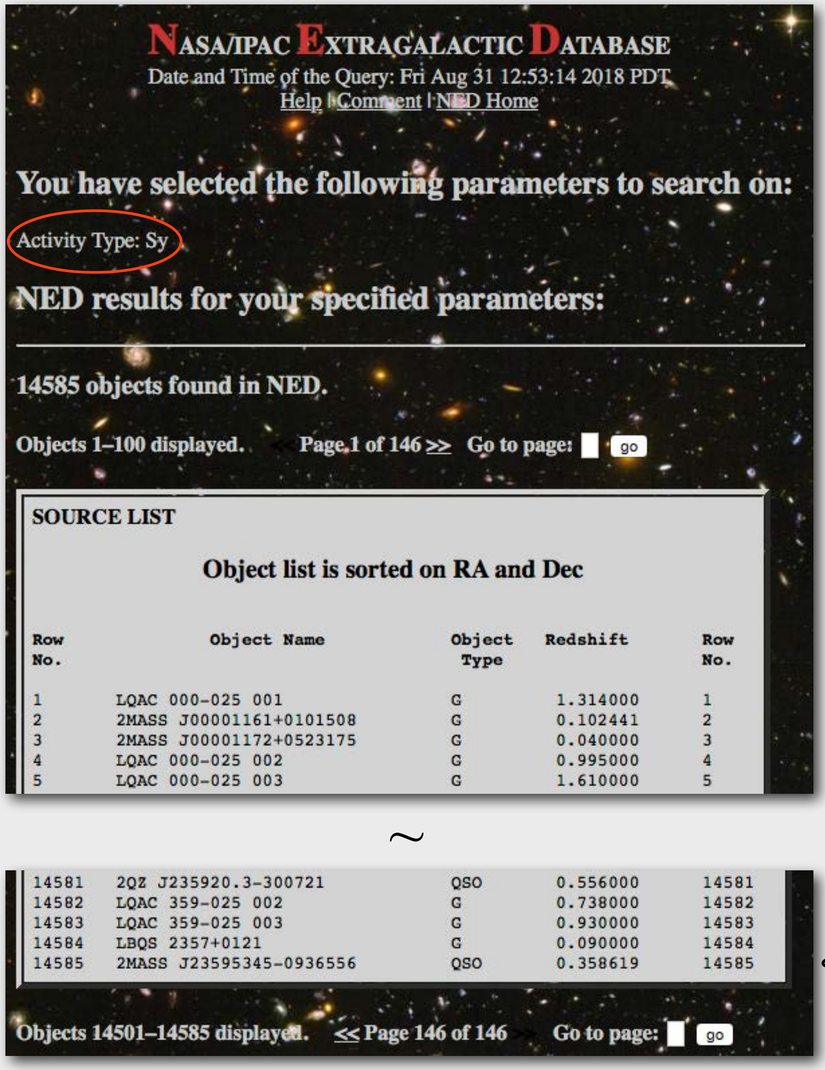


Space-density of Seyfert galaxies

Any uniquely-identifiable subset of the galaxy population that is expected to constitute some fixed percentage of the total galaxy population can be used to confront the volume function with empirical data. One such example are galaxies classified as Seyfert galaxies, which are spiral galaxies with unusually bright nuclei that produce broad emission lines. Referencing NED and using a similar procedure as that used to analyze the general AGN population, the redshift population distribution of Seyfert galaxies is graphed subsequently…

NED Seyferts

Click *image* for source data,
here for precompiled datafile.



NASA/IPAC EXTRAGALACTIC DATABASE

Date and Time of the Query: Fri Aug 31 12:53:14 2018 PDT

Help | Comment | NED Home

You have selected the following parameters to search on:

Activity Type: Sy

NED results for your specified parameters:

14585 objects found in NED.

Objects 1–100 displayed. << Page 1 of 146 >> Go to page: go

SOURCE LIST

Object list is sorted on RA and Dec

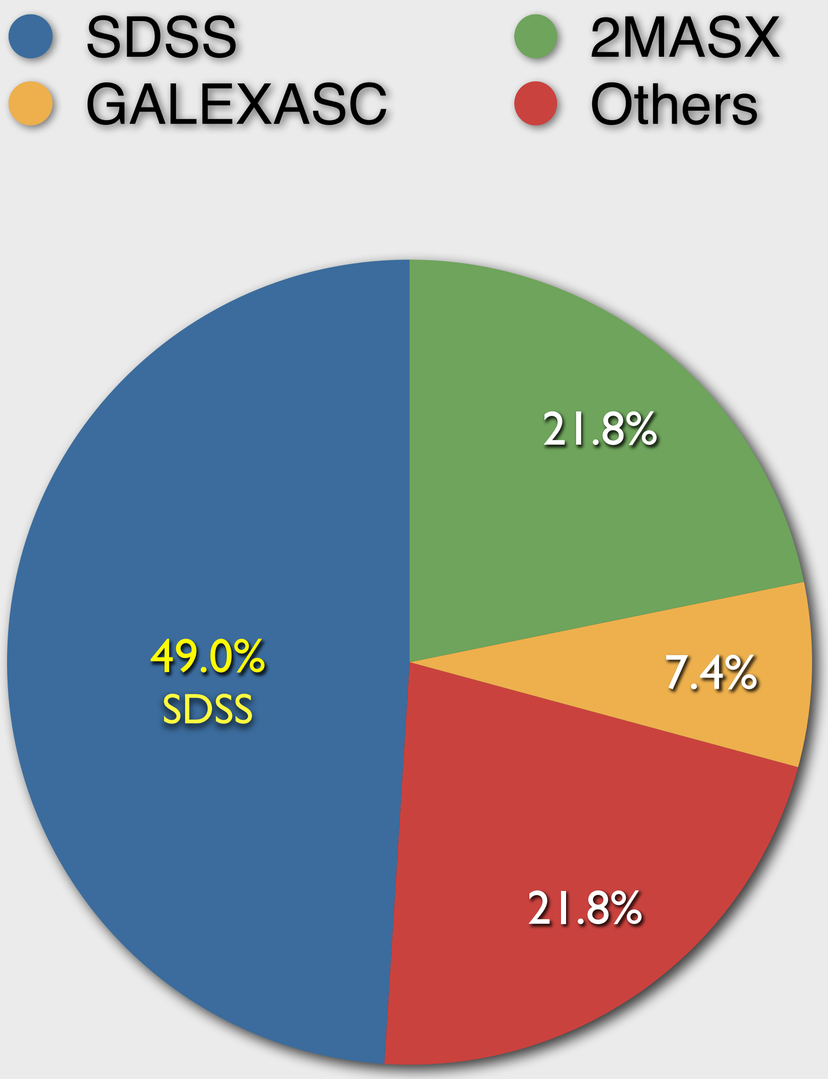
Row No.	Object Name	Object Type	Redshift	Row No.
1	LQAC 000-025 001	G	1.314000	1
2	2MASS J00001161+0101508	G	0.102441	2
3	2MASS J00001172+0523175	G	0.040000	3
4	LQAC 000-025 002	G	0.995000	4
5	LQAC 000-025 003	G	1.610000	5

~

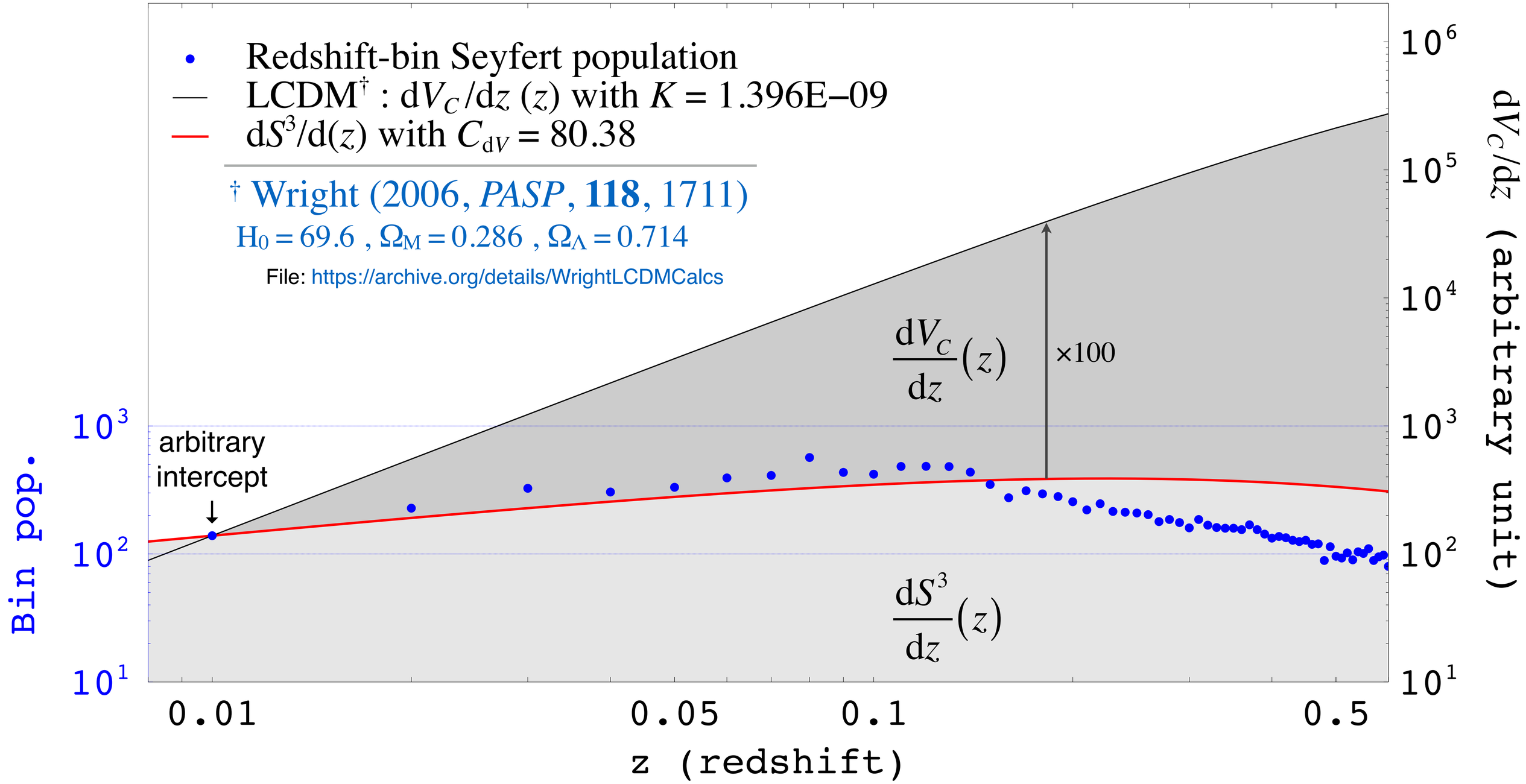
14581	2QZ J235920.3-300721	QSO	0.556000	14581
14582	LQAC 359-025 002	G	0.738000	14582
14583	LQAC 359-025 003	G	0.930000	14583
14584	LBQS 2357+0121	G	0.090000	14584
14585	2MASS J23595345-0936556	QSO	0.358619	14585

Objects 14501–14585 displayed. << Page 146 of 146 >> Go to page: go

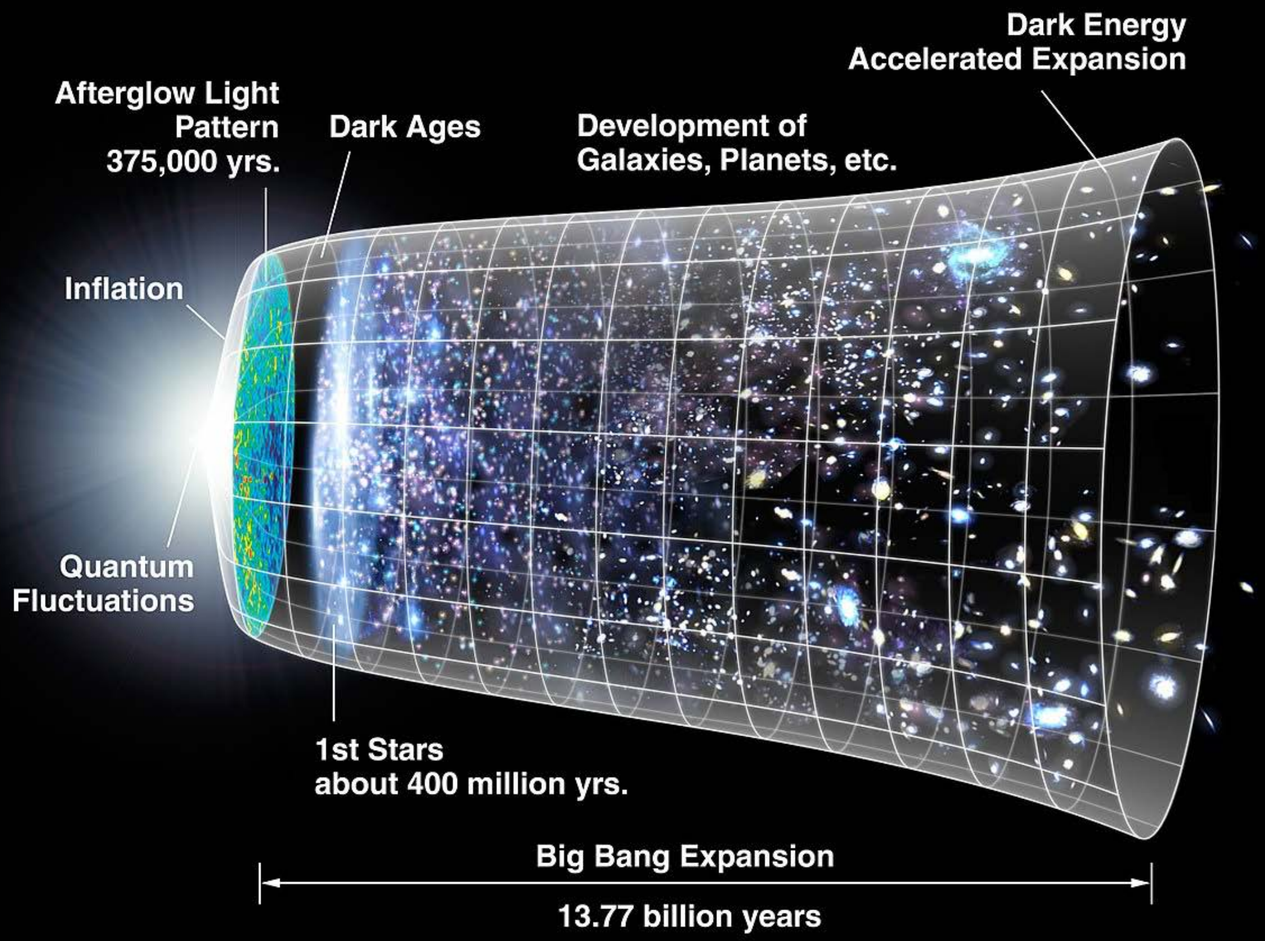
⟸14,585 Seyferts

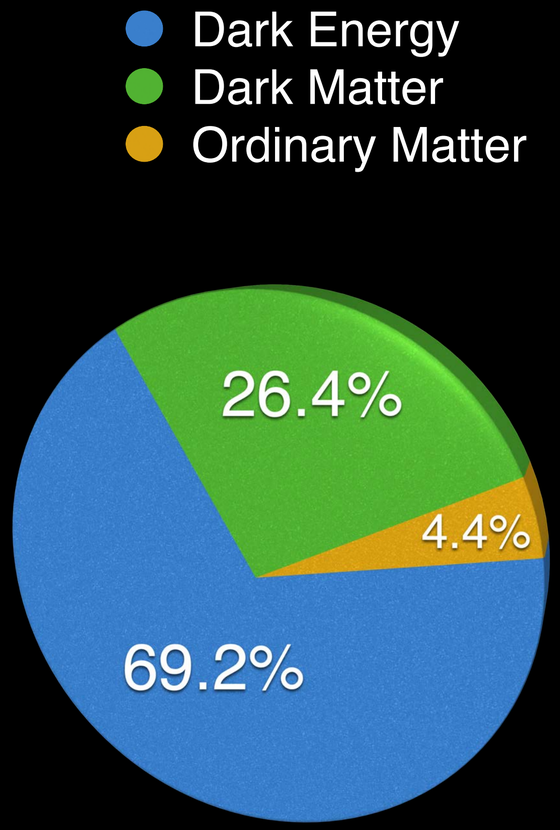


Seyfert redshift-bin population vs. volume-element models



A DEFINITIVELY-FALSIFIED MODEL





Plank Collaboration, *Plank* 2015 Results. XIII. Cosmological Parameters; arXiv:1502.01589 [astro-ph.CO]

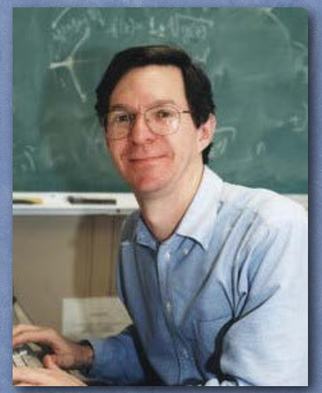
This isn't just *wrong* — it's "*spherically* wrong."

(i.e., the same from every perspective, as per Fritz Zwicky)

The greater meaning of this document beyond its scientific content

I want to argue that clear thinking, combined with a respect for evidence — especially inconvenient and unwanted evidence, evidence that challenges our preconceptions — are of the utmost importance to the survival of the human race* in the twenty-first century, and especially so in any polity that professes to be a democracy.

– Alan Sokal,
Professor of physics at New York University
Professor of mathematics at University College London



Alan Sokal

* One must concede that there is such a thing as “dangerously stupid.”

Source: A. Sokal, “What is science and why should we care? — Part I,” *Scientia Salon* (26 March 2014).

Tycho Brahe*
(1546 – 1601)

James Edward Gunn,

“Father” of the SDSS

“In 1987 Gunn proposed putting an array of CCDs on a 2.5m-telescope and using it for both images and spectra, scanning the entire visible sky in about five years and building an enormous data archive which could be used for far more than his main interest, determining the three-dimensional structure of the universe of galaxies. This ultimately became the Sloan Digital Sky Survey, and Gunn devoted a large portion of his career to building it and making it work.”

Source: http://phys-astro.sonoma.edu/brucemedalists/james-gunn

The perfect candidate for the
NOBEL PRIZE IN PHYSICS
for *real* contributions to science.

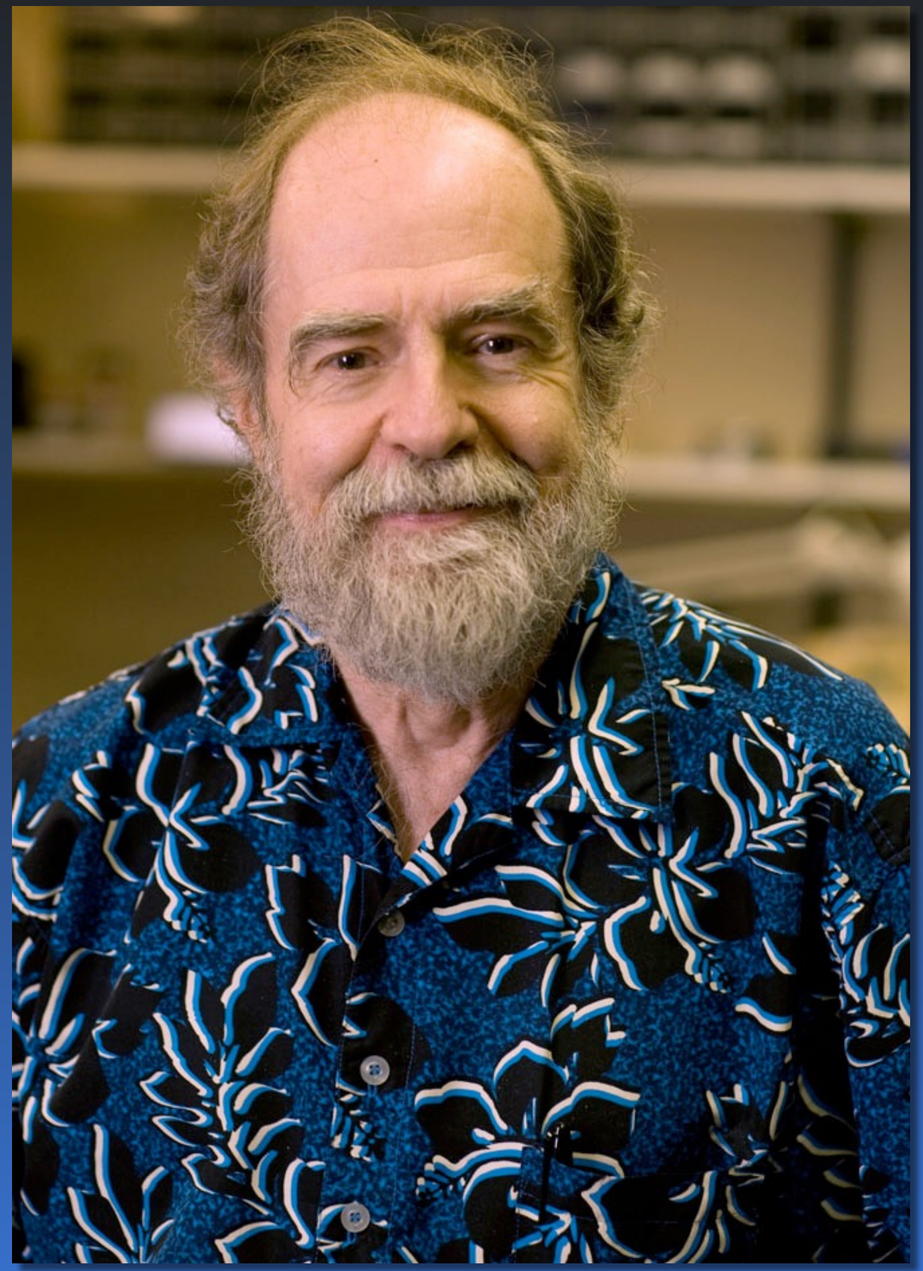


Photo 2009 by Brian Wilson • brianwilsonphotographer.com •

J. E. GUNN ET AL., “THE 2.5 m TELESCOPE OF THE SLOAN DIGITAL SKY SURVEY,”
THE ASTRONOMICAL JOURNAL, 131:2332 – 2359, 2006 April

2

* Tycho Brahe’s accurate astronomical data allowed Johannes Kepler to discover that the planets moved in elliptical orbits, which led to Isaac Newton’s universal law of gravitation. James Gunn’s work proves to be of a similar nature.

Impromptu, hand-held, amateur video footage taken during the talk and Q&A:

https://youtu.be/KlQmVdgMv14

I should not have used the phrase, “catastrophic failure of the model” during my talk, as this may be interpreted as a subjective opinion, and it could engender strong negative emotions in certain individuals. People should come to that conclusion on their own from the evidence.

I thank Dr. César Augusto Zen Vasconcellos for the opportunity to present this research at IWARA 2018; malevolent political forces temporarily suppressed it.

This slide updated 31 Aug. 2022.

I thank the entire SDSS Team over many years (from DR4 in 2005 to present). I am privileged to have had the opportunity to benefit from their life's work and they share directly in the achievement of scientific discovery that arises from it.

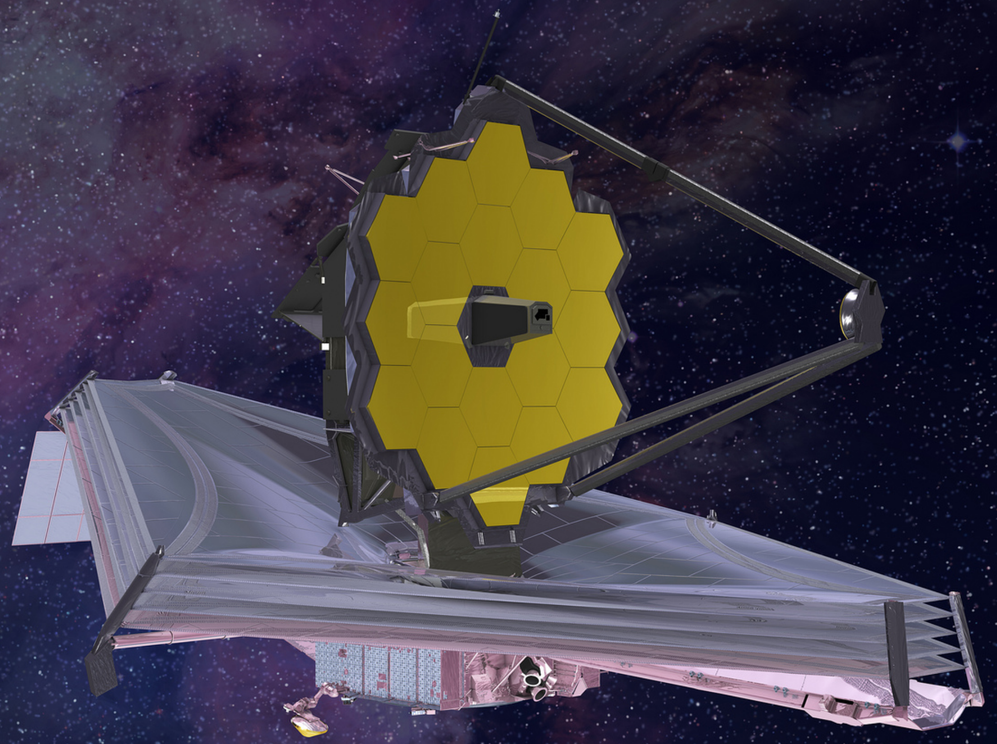
In addition, I thank the engineers, computer scientists, executive management and support staff of Apple Computer, Wolfram (Mathematica), Google, Wikimedia, Adobe, Microsoft (SQL Server), Oracle (MySQL), and PremiumSoft (Navicat) for providing the tools and services that performed essential roles in this research.

Although prior *analysis* of CMBR and supernovae data, of which I am aptly critical, may have been flawed, it is clear that the related projects have contributed in no small measure to this research. I thank the teams of engineers, technicians, and astronomers, in particular the legion of NASA/JPL staff and NASA contractors, who made those challenging observational enterprises possible.

This research is not the work of one person; it is the success of many thousands.

James Webb Space Telescope

Launch Date: 25 Dec 2021
First Data Release: 12 July 2022



- 6.5-m 18-segment primary mirror
- Near Infrared Camera (NIRCam)
  $0.6 \leq \lambda \leq 5$ microns
- Near Infrared Spectrograph (NIRSpec)
  $0.6 \leq \lambda \leq 5$ microns
- Mid-Infrared Instrument (MIRI)
  $5 \leq \lambda \leq 28$ microns
- Fine Guidance Sensor/Near Infrared Imager and Slitless Spectrograph (FGS/NIRISS)
  $0.8 \leq \lambda \leq 5$ microns

There is no such thing as the “early Universe”; JWST will see that cosmological creation is an eternal process and that the Universe is similar yet different everywhere, as is true for Earth.

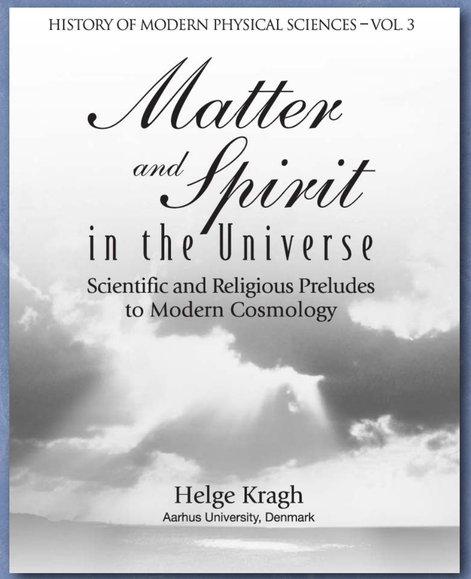
This slide updated 31 Aug. 2022.

In 1921, a young Belgian mathematics postdoc and seminarian by the name of Georges Henri Lemaître wrote an essay entitled *God's First Three Declarations*.* The author stated that this 1921 essay was "an attempt to describe scientifically the first verses of Genesis." This biblically-inspired essay, discovered in the archives of the Catholic University of Leuven in the late 20th century, is the actual root of the Big-Bang theory. Lemaître (July 1894 – June 1966) was ordained as a Catholic priest in 1923.

Georges Lemaître

* Footnotes: "Les trois premières paroles de Dieu."
The manuscript is reproduced in Stoffel (1996), pp. 107–111.
Lemaître's religious views are discussed in Lambert (1997).

Source: Helge Kragh, *Matter and Spirit in the Universe* (Imperial College Press, London, 2004), p. 141.


HISTORY OF MODERN PHYSICAL SCIENCES – VOL 3
Matter and Spirit in the Universe
Scientific and Religious Preludes to Modern Cosmology
Helge Kragh
Aarhus University, Denmark

Click the book cover for *Journal for the History of Astronomy* review article by E. McMullin (2005).

In June1925, Lemaître met with Hubble at Mt. Wilson.[1,2]

Courtesy Huntington Library

(1) references Mt. Wilson
(2) references Caltech

1. John Farrell, *The Day Without Yesterday: Lemaître, Einstein, and the Birth of Modern Cosmology*, New York: Thunder's Mouth Press, 2005, p. 78.
2. Jeremiah P. Ostriker & Simon Mitton, *Heart of Darkness: Unraveling the Mysteries of the Invisible Universe*, Princeton: Princeton Univ. Press, 2013, p. 68.

Screen shot of detailed online abstract from MG12 (July 2009)

COM2 - Dark Energy and Universe Acceleration

Speaker	Mayer, Alexander
Talk Title	Cosmological Implications of the SDSS and 2dF Redshift–Population Histograms
Abstract	Empirical observation of galaxy population density in redshift space is inconsistent with expectations based on the canonical cosmological model. The magnitude of this inconsistency implies a significant error in the canonical model's theoretical redshift-distance relationship. A new model has been derived that rests on first principles and which is consistent with observed galaxy population density in redshift space. Additionally, the observed Type Ia supernovae redshift-luminosity curve does not require interpretation as accelerating cosmic expansion. Moreover, the revised redshift–distance relationship of the proposed new model implies that the entire mass of early-type galaxies associated with observed Einstein rings is composed of normal matter; no "dark matter" need be assumed to exist in these systems.
Talk view	This abstract should be viewable online under L. Cosmological Models COM2: A

Also see FFP11 SCIENTIFIC PROGRAM (7 July 2010 @ 16h – 16h20); the data-supported model herein was presented. The Q&A session was *preemptively* terminated by session chair, Paul Steinhardt, with the following threatening admonition to the audience: "There will be no questions about this nonsense"; any insubordination was clearly a 'career-ending move.'

This slide updated 31 Aug. 2022 (added FFP11 reference).

Actually, *no* — the Book of Genesis and cosmology are completely unrelated.

Science Proving Bible's Tale Of Creation

By ROBERT JASTROW
N.Y. Times News Service

When an astronomer writes about God, his colleagues assume he is either over the hill or going bonkers. In my case it should be understood from the start that I am an agnostic in religious matters. However, I am fascinated by some strange developments going on in astronomy — partly because of their religious implications and partly because of the peculiar reactions of my colleagues.

The essence of the strange developments is that the universe had, in some sense, a beginning — that it began at a certain moment in time, and under circumstances that seem to make it impossible — not just now, but ever — to find out what force or forces brought the world into being at that moment. Was the creative agent one of the familiar forces of physics, or was it, as the Bible says, "Thine all-powerful hand that creates the world out of formless matter?"

★ ★ ★

(EDITOR'S NOTE: Robert Jastrow, director of NASA's Goddard Institute for Space Studies, is convinced that, "The essential elements in the astronomical and Biblical accounts of Genesis are the same" — emotional words for one of the world's leading astrophysicists, and about as far from scientific jargon as one can get. Jastrow reports on the progress of this marriage between theology and cosmology, which gives new meaning to the words, "In the beginning . . . ")

★ ★ ★

And this question, more interesting than any other, can never be answered. We can never tell whether the hand of God was at work in the moment of Creation — for a careful study of the stars has proved, as well as anything can be proved in science, that the universe came into being 20 billion years ago in a cataclysmic explosion. In the searing heat of that first moment, all the evidence needed for a scientific study of the cause of the great explosion was melted down and destroyed.

This is the crux of the new story of Genesis. It has been familiar for years as the "big-bang" theory, and has shared the limelight with other theories, especially the "steady-state" cosmology; but adverse evidence has led to the abandonment of the steady-state theory by nearly

(Please Turn To Page 12A, Col. 1)

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The Book of Genesis has nothing whatsoever to do with the *science of cosmology*, which is the rational study of the Universe on the largest scales of space and time, not the origins of the youthful cosmic 'microcosm' that is the Earth and the typical utter madness of its delusional, egomaniacal, narcissistic, self-appointed human 'authorities.'

This slide added 31 Aug. 2022.

MNRAS **000**, 000–000 (0000) Preprint 25 April 2022 Compiled using MNRAS LATEX style file v3.0

Will LCDM cosmology survive the James Webb Space Telescope?

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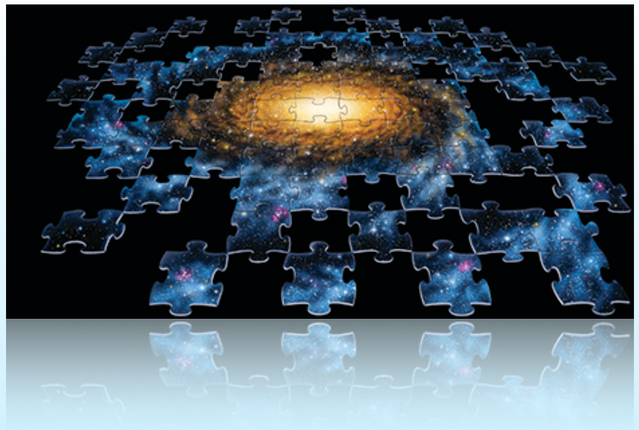
Last Rev. 22 April 2022

ABSTRACT

The James Webb space telescope (JWST) is about to deliver scientific data. Fundamental contributions are expected in all fields of astronomy. Here we focus on the distant Universe, for the JWST is expected to consolidate once and for all the Lambda Cold Dark Matter (LCDM) cosmology. Most crucially, "The End of the Dark Ages: First Light and Reionization" and "The Assembly of Galaxies" are the first two of the four primary JWST Science Goals. Here we critically challenge the general expectations, giving a set of alternatives, presented before they can be either proved or disproved. Our conclusion is that the JWST will provide data incompatible with LCDM cosmology, forcing a revolution both in astronomy and fundamental physics.

Key words: — Cosmology: general

This slide added 31 Aug. 2022.



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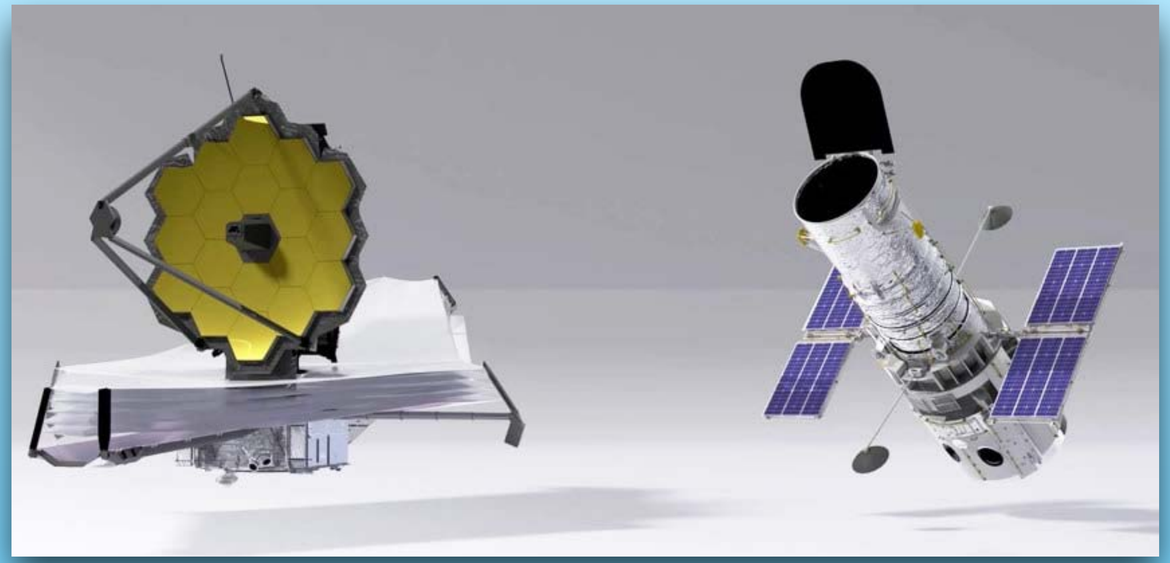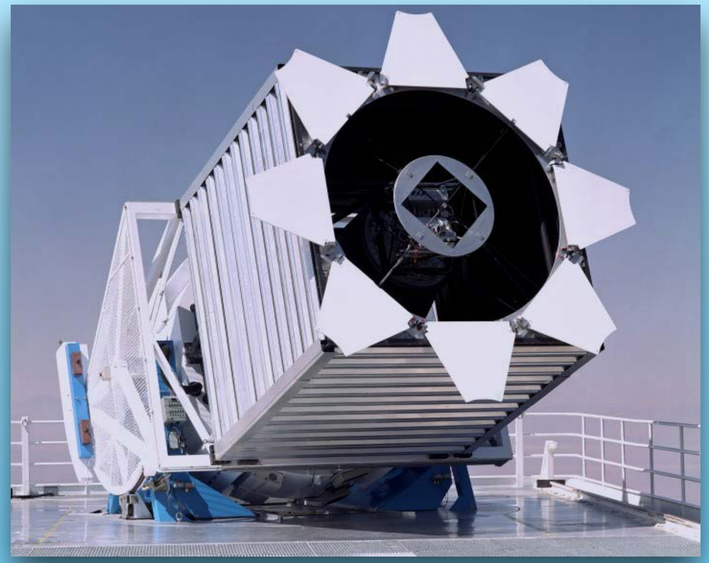
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